POPULAR SCIENCE

MONTHLY

MECHANICS - AUTOS - HOMEBUILDING

New Thrills on Water

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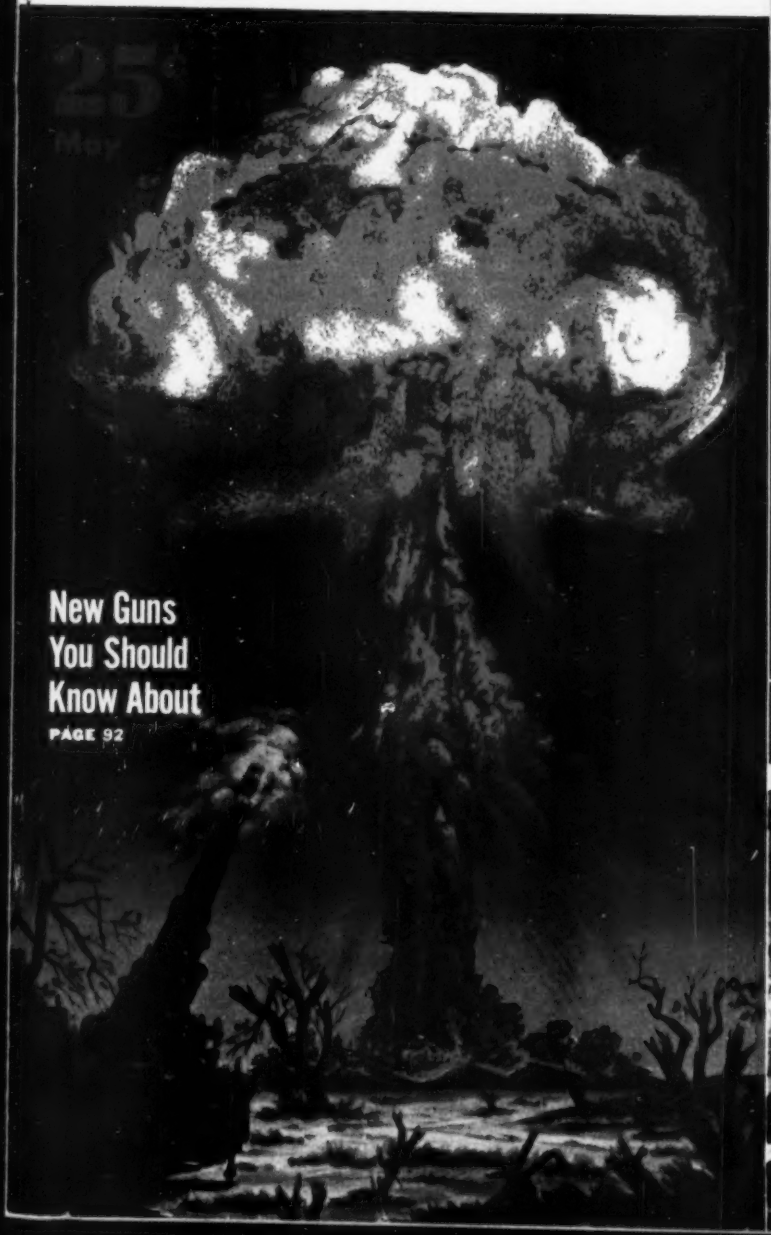

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Amazing New Attachment Stops TV Interference In Case After Case!

Sensational Low Priced Device "Drowns Out" Ghosts, Snow, Static, other interferences and "Brings In" More Stations For Viewers!

By ROBERT GRANT

—A New York engineer has demonstrated that you can now help do away with TV interference . . . that you can have clearer, sharper, brighter TV pictures . . . that you can "bring in" stations formerly impossible to receive—perhaps double or triple the enjoyment and value you get from your present TV set . . . *and do all this in just 30 seconds WITHOUT buying a new antenna . . . but by actually increasing the efficiency of your present antenna so that it enables your set to "DROWN OUT" interference!*

Yes, the next time you turn on your TV set, instead of weak, wobbly, blurry, faded TV reception . . . instead of getting a picture marred by snow, blurs and "double image," an amazing low priced device makes it possible for you to sit back and enjoy en entire evening of trouble free, bright, sharp, clear reception! Here's the secret!

BEFORE! Does your TV set behave like this? This interference is caused by reflections from nearby buildings. Or, it may be caused by metal objects near your home.

AFTER! But now see how this interference is gone from the picture! Read this page. Learn how *this amazing, inexpensive device* can give you more perfect TV pictures.

WHAT CAUSES TV INTERFERENCE?

The signals your TV stations send out are absolutely "clean" and have no interference waves. Then why don't you get clear, sharp pictures? Because in this electronic age there are many more signals which your antenna also picks up and which fight for attention on your TV screen!

You get interference signals from FM stations, other TV sets, neighbors' electrical appliances, oil burners, trains, busses, power stations, ships, factories, etc. You see this distortion and interference on your screen in the form of streaks, lines, blurs. Actually, the trouble is not inside your set but outside!

HOW THIS AMAZING DEVICE WORKS!

Notice how your radio gets interference when tuned a fraction off. But when you tune in the radio signal correctly . . . your radio signal becomes stronger . . . your volume can be lowered and your radio interference fades away.

In the same way, television interference gets through to your screen because the TV signal is not STRONG ENOUGH. It cannot "fight off" the interference signals the way your radio set "fights off" static when tuned in perfectly.

But now this amazing low priced attachment can match the TV signal on your picture properly with the TV station signal . . . so that your TV signal becomes so strong . . . so clear that outside interference such as streaks, double image, etc., are drowned out.

WHAT THIS MEANS TO YOU

The TELEBEAM CLARIFIER with the MAGIC RING for better tuning is only 6 inches long. It fastens to the antenna screws on the back of your set in just 30 seconds. Any one can do it. But when you do this simple, easy thing your TV signal instantly is amazingly strengthened . . . interference and static vanish from your screen!

NEVER BEFORE SUCH PRAISE FROM TV OWNERS!

Thousands of TV owners have already tried this amazing device. You have never seen such "raves".

In case after case distortion, interference, ghosts, snow disappeared when the TELEBEAM CLARIFIER was attached. Again and again washed out, weak, blurry, muddy pictures changed into sharp, brilliant, clear reception.

VIEWERS NOW RECEIVE STATIONS THEY FORMERLY COULD NOT RECEIVE!

User after user of the amazing new TELEBEAM CLARIFIER reports receiving stations they formerly could not receive . . . receiving stations formerly so bad they weren't worth watching. Now this great low priced device guarantees you more perfect reception from ALL the stations your set should pick up! Or your money back. You can't lose!

SEND NO MONEY! TRY TELEBEAM CLARIFIER AT OUR RISK!

Try it on the 7-day no-risk trial. If you do not get better, clearer reception than you ever dreamed possible, your money will be returned immediately. No questions asked. You be the judge. The factory is manufacturing only a limited number at this time, so don't put it off. Mail the no risk coupon to Otis Co., Dept. L-40, Telebeam Div., 141 Fifth Ave., New York 10, N. Y.

THE TRUTH ABOUT POOR RECEPTION. STOP THIS TV INTERFERENCE FOR GOOD

See how your antenna picks up interference from factory machines, trucks, automobiles, doctor's equipment, railroad tracks, etc. This interference appears on your screen in the form of double images, blurs, snow, etc. Don't blame your set! Simply attach the sensational TELEBEAM CLARIFIER. In a jiffy interference, distortion, streaks, snow, ghosts, lines, etc., disappear. This interference is smothered by the strong, clear TV signal the TELEBEAM CLARIFIER makes possible. In just 30 seconds you may double or triple your TV enjoyment!

USERS GET RID OF TV TROUBLES IN JUST 30 SECONDS!

Mr. W. E. F. of New Providence, N. J. writes, "Formerly bothered with ghosts and interference. When I installed the Telebeam Clarifier the pictures were so good my friends asked me to get Telebeam Clarifiers for them. I can also receive Channels 3, 8 and 10 with the Telebeam Clarifier which I did not get at all before."

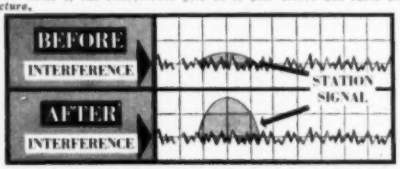
Mr. E. N. of New York City writes, "Found that Clarifier cleared up my ghosts, improved my contrast on all channels, improved sound, cleared up snow. Very pleased."

Mr. B. C. of Brooklyn, N. Y., writes, "Clarifier improved quality and strength of the sound and picture and the channels that were weak and ghosty. Also FM signal much better than before."

READ WHAT AN EXPERT TV SERVICEMAN SAYS:

Mr. J. A. C., President of a Brooklyn, N. Y. TV service company writes, "ghosts were no longer visible and interference was eliminated. Unbelievable. TV servicemen will sure welcome."

Here you see your present TV signal "Too close" to the interference level. Some of the interference gets on to your screen and ruins your picture.



When the TELEBEAM CLARIFIER is attached, the TV signal is made more efficient . . . stronger . . . raised out of the interference level. Interference can no longer MAR reception. You get a more perfect picture.

FOR CLEARER TV RECEPTION—MAIL COUPON TODAY!

OTIS CO., Dept. L-40
Telebeam Division
141 Fifth Avenue, New York 10, N. Y.

I want to try the TELEBEAM CLARIFIER on my TV set without any risk. I understand that it must drown out TV interference and improve reception, or it will cost me nothing. Please send TELEBEAM CLARIFIER at the direct-by-mail price of only $2.98 C.O.D. If I am not delighted with results you will refund my money, no questions asked.

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Address . . . . . .

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Here at last—after long careful preparation—the latest 1953 automotive manual that shows you how to save $$$ on gas, tires, repairs, accessories. This amazing book, hot off the presses is the NEWEST now available in America! It gives you the down-to-earth facts on how to get 30, 40, 50 miles on a single gallon of gas. No longer need you get rattled to see "tin can jaloppies" beat you at the light everytime . . . leave you in the dust on the highway! Now you can give your car greater pep, add up to 30 miles per hour to its top speed, surge ahead from 0 to 60 miles in 12 seconds flat. You can save hundreds of dollars annually, burn water with gas, extend car life by simple easy tricks, quickly recondition cylinder walls without removing the motor! It seems incredible but it's true! Many of these methods have been tested by huge industrial and oil firms, special laboratories, government bureaus. Some are used by the Army, Navy and Air Force. Some have come from the Indianapolis Speedway champions. Now this information is yours in the new 1953 book: "HIGH SPEED & EXTRA POWER"—hot off the presses.

Easy Pictures Show you How

No need to be a mechanic! Easy directions & clear pictures show you how to get more speed, extra power, greater economy with only a screwdriver. Tells of cheap gadgets that work miracles with any motor, a 1953 model or a junkyard derelict! Shows you how to SAVE up to $500.00 a year, increase resale value of your car, reduce repair costs.

Hundreds of Valuable Money Saving Secrets!

Here is some of the amazing information given you: 20 ways to save gas or oil; alcohol-air injection systems; mixing air & fuel; car super-charging ideas; speed and power tuning; how to increase top power & speed, get instant starts in winter, better pick-up on hills; 10,000 extra tire miles, make minor repairs yourself and save plenty, new plastic methods for removing body dents; new paints that go right over rust. **PLUS: HUNDREDS** of other ideas on adjustment & maintenance of your car inside and out! Thousands of wide-awake Americans have this money saving knowledge. Have you? Get your **"Higher Speed and Extra Power Manual"** now! Stop wasting gas and oil. Stop paying for sucker repairs! Get more power, more speed! Get faster get-away! Leave 'em in the dust with a higher compression car!

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Founded 1872, Vol. 162: No. 5

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Mechanics and Handicraft
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MAY, 1953

This Month's Cover Is an Historic Step Forward in Printing

Look twice at this month's cover. That picture of an atomic shell exploding was printed with fluorescent ink, in addition to the regular color ink used to reproduce the other pictures on the cover. This is the first time such ink ever has been used in this way on the cover of a national magazine. It was manufactured especially for this issue of POPULAR SCIENCE MONTHLY by the Interchemical Corporation's Printing Ink Division.

I have seen two atomic bombs burst, and this is the finest portrayal of the fiery sight that I have ever seen on a printed page.

The story of the man who has brightened the world's colors, and thus made pictures such as this possible, is told on page 154. I think everyone interested in the application of science to everyday life will find it fascinating.

VOLTA TORREY

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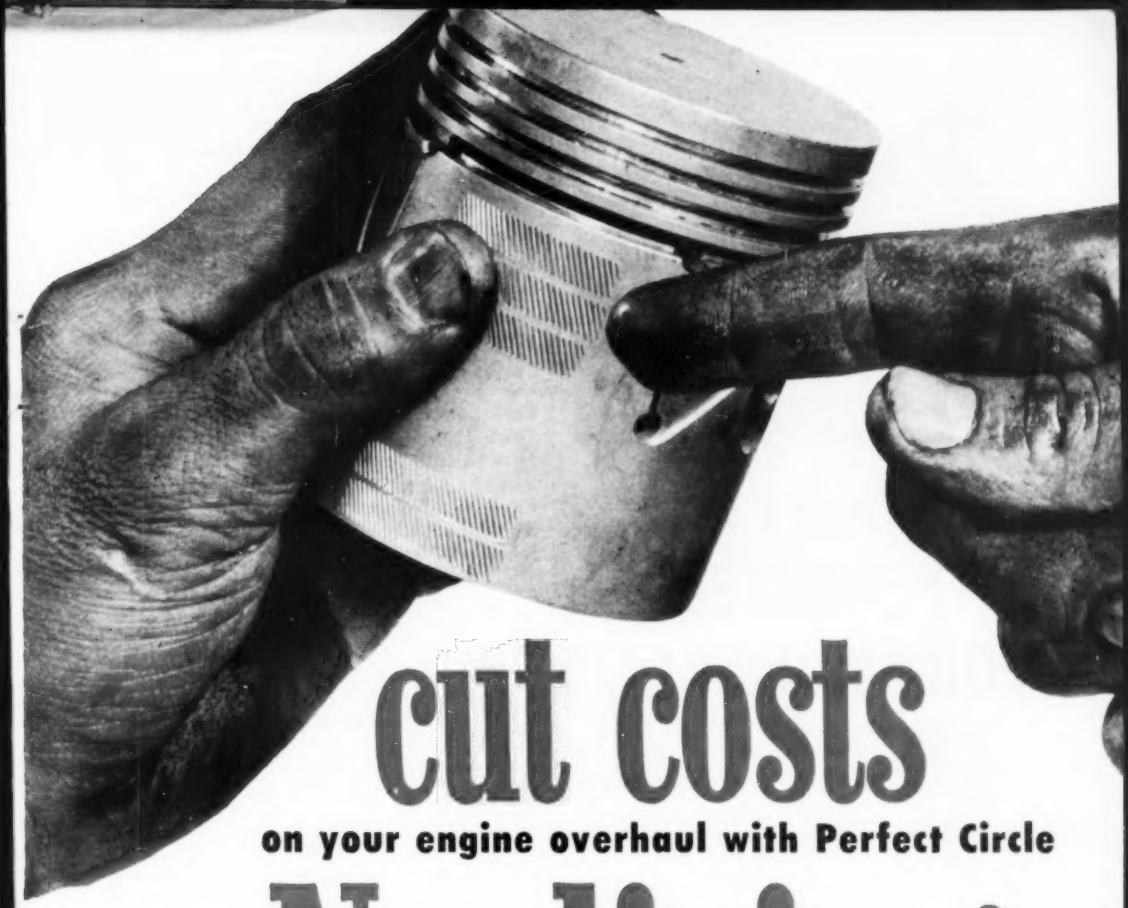

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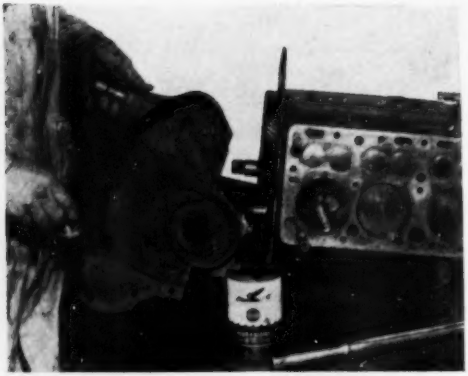
Perfect Circle NURLIZING PISTON RINGS

The Standard of Comparison



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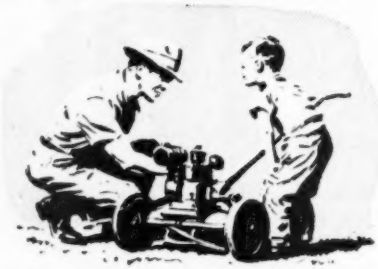
NEXT MONTH . . .

Magnetos Are No Mystery



You don't have to go back to cutting the grass by hand if your power mower fails, or dry-dock your outboard if the kicker kicks up. Most small-engine troubles are in the magneto, and most magnetos are easy to fix once you know their innards. Next month PSM will show you how simple adjustments will put any small engine back to work in a hurry.

Be an Expert in Your Field

—and earn an expert's pay!

LOOK around you. *Who* are the men earning top pay today? *Whose* services are big companies bidding for—with high wages—attractive working conditions—long vacations—extra benefits? *Who* are the wage earners with the nicest cars and homes, the best clothes?

IT'S THE EXPERTS—men who really "know their stuff" in an important specialized field. Men with more *skill* or *special knowledge* than their fellow-employees.

Note to Employers

We have many calls from employers for I.C.S. graduates. If you need trained men, perhaps we can help you. Write for names and addresses of I.C.S. graduates in your area. Address Placement Division.

Why the Expert Is King

The expert has always fared better than others. But today *the expert is king*. Why? Because tremendous growth in many important fields has caused a *serious shortage* of trained men. Just one example: it has been estimated that the nation needs 80,000 new engineers a year—but is turning out only 20,000!

But how can you *become* an expert, without giving up your present job and pay? Nearly six million people have turned to I.C.S. home study courses as the most practical way. Right at home (in any spare time that suits you best) you acquire the additional "know-how" you need from your choice of 296 I.C.S. subjects. One or more of I.C.S.'s staff of 154 expert instructors will give *personal attention* to your individual progress.

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- ☐ Structural Drafting
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- ☐ Sheet Metal Work
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- ☐ Radio Servicing—FM
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- ☐ Railroad Administration

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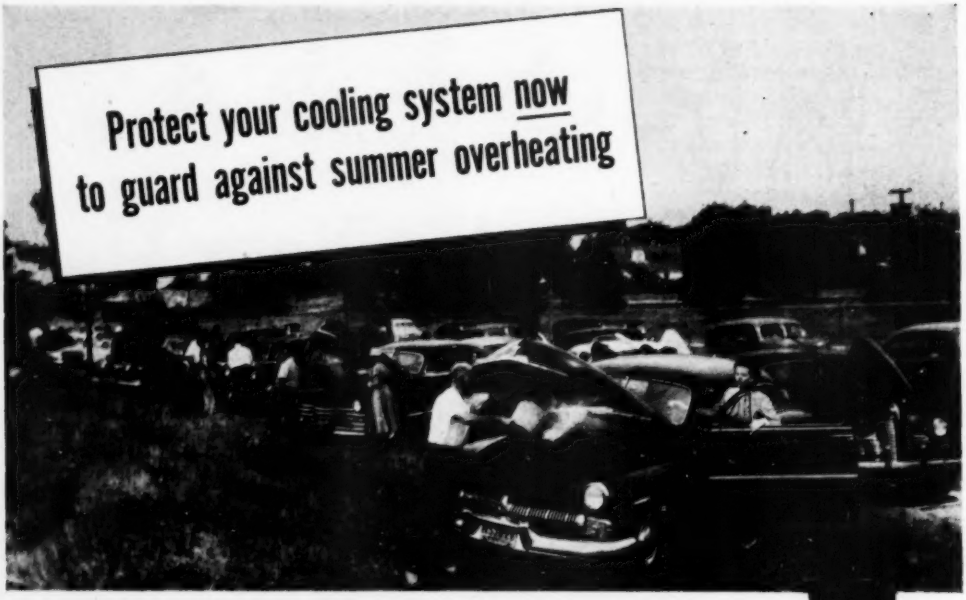
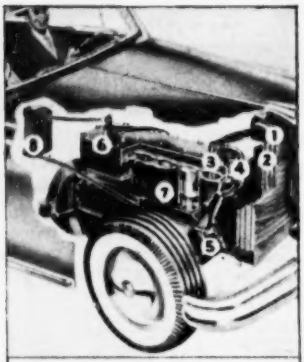


Cooling system failure—on the New York Southern State Parkway last summer—stranded these motorists.

NEW DU PONT ANTI-RUST

and Water Pump Lubricant

RETARDS RUST FORMATION, NEUTRALIZES CORROSIVE ACIDS



HERE'S WHERE Du Pont Anti-Rust works in your car's cooling system to neutralize acid, retard rust and corrosion, lubricate moving parts. 1. Radiator tanks. 2. Water tubes. 3. Thermostat. 4. Water pump. 5. Hose connections. 6. Cylinder head. 7. Cylinder wall. 8. Heater.

Just pour it in the radiator, leave it in!

Now, you can easily eliminate one hot-weather worry—failure of your car's cooling system. Most overheating is caused by clogging due to rust, and corrosive attack. New Du Pont Anti-Rust not only inhibits rust, but neutralizes acids and lubricates the water pump as well.

Best of all, liquid Du Pont Anti-Rust is simple to use. Just pour it in your radiator and forget it. It starts immediately to protect you against troublesome breakdowns and costly repairs. And Anti-Rust can't clog . . . is harmless to hose or metal parts. Get it at your service station or auto supply store—$1.00 at most dealers.

DU PONT

REG. U. S. PAT. OFF.

Better Things for Better Living
. . . through Chemistry

DU PONT SPRING DRAIN-OUT:

Ask at your garage or service station about this complete summer protection. The service includes 1. Draining out winter-worn anti-freeze. 2. Thoroughly cleaning out rust and scale with Du Pont Cooling System Cleanser. 3. Adding Du Pont Anti-Rust and Water Pump Lubricant. 4. Checking all cooling system parts.

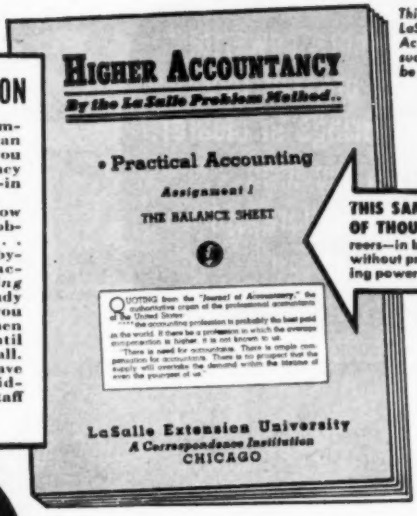
DU PONT COOLING SYSTEM CLEANSER

This *FREE SAMPLE LESSON*

will prove you can become an expert

BOOKKEEPER . . . ACCOUNTANT OR C.P.A.

This well-paid LaSalle-trained Accountant's success could be yours.



THIS SAME LESSON HAS STARTED HUNDREDS OF THOUSANDS toward well-paid accounting careers—in business, government, and as C.P.A.'s. Even without previous knowledge, progress is rapid—earning power climbs fast. This sample lesson shows why.

FREE SAMPLE LESSON

We offer you this free sample lesson so that you can *prove to yourself* that you CAN master Accountancy—quickly, thoroughly—in spare time at home.

You will see exactly how LaSalle's famous "Problem Method" works . . . how you are led step-by-step through actual accounting work—*learning by doing* and not by study of theory alone. First you tackle easy problems, then more difficult ones—until soon you master them all. And at every step you have the close personal guidance of LaSalle's large staff of C.P.A. instructors.

Nearly 10% of all C.P.A.'s in the U.S. have been trained by the LaSalle Problem Method

IF you have been envying the high incomes and good jobs enjoyed by thousands of men and women Accountants today . . . incomes ranging from $4,000 to $10,000 and more per year . . . why not launch such a career for yourself?

Do you doubt that you can?

Then let us send you—without cost or obligation—the same Lesson Number One with which LaSalle has started several hundred thousand men and women toward successful accounting careers. We want you to see for yourself how this remarkable method, originated by LaSalle, makes Accountancy simple, interesting, practical, and certain . . . how it leads you step-by-step to a complete mastery of Accounting—and on up to the coveted degree of Certified Public Accountant if you so aspire.

It doesn't matter whether you've had previous bookkeeping experience, or whether you don't know a debit from a credit. Whether you wish to qualify as an expert bookkeeper, advanced accountant, cost accountant, auditor, government accountant, income tax specialist, or public accountant . . . you'll find in LaSalle's Problem Method the exact plan to prepare you rapidly and inexpensively—in spare hours at home—without losing a day from your present job.

So right now, today . . . if you are an adult, employed, and earnestly ambitious for rapid advancement in this highest-paying of all professions . . . send your name and address on the coupon below. We'll send the free sample lesson—plus our 48-page book outlining today's career opportunities and how you can qualify for them. A coupon like this has started many thousands toward greater success. It can do the same for you. Mail it today!

GOOD-PAY JOBS IN 5 BIG FIELDS

If you were an expert accountant right now, chances are you would find yourself among the highest-paid of all professional men and women. Surveys show that accountants earn more than those in other major professions.

There are five big fields of opportunity open to Accountancy-trained men and women . . . opportunities that are wide open and highly inviting, offering maximum income and job security in good times or bad. And under LaSalle's "Problem Method" you can start earning while still learning—either in spare-time or full-time employment . . . or in business for yourself with no capital required.

Get the latest information by sending for our 48-page book, "Accountancy, the Profession That Pays" . . . plus free sample lesson. The coupon at right will bring both to you without cost or obligation. LaSalle Extension, 417 S. Dearborn St., Chicago 5, Ill.

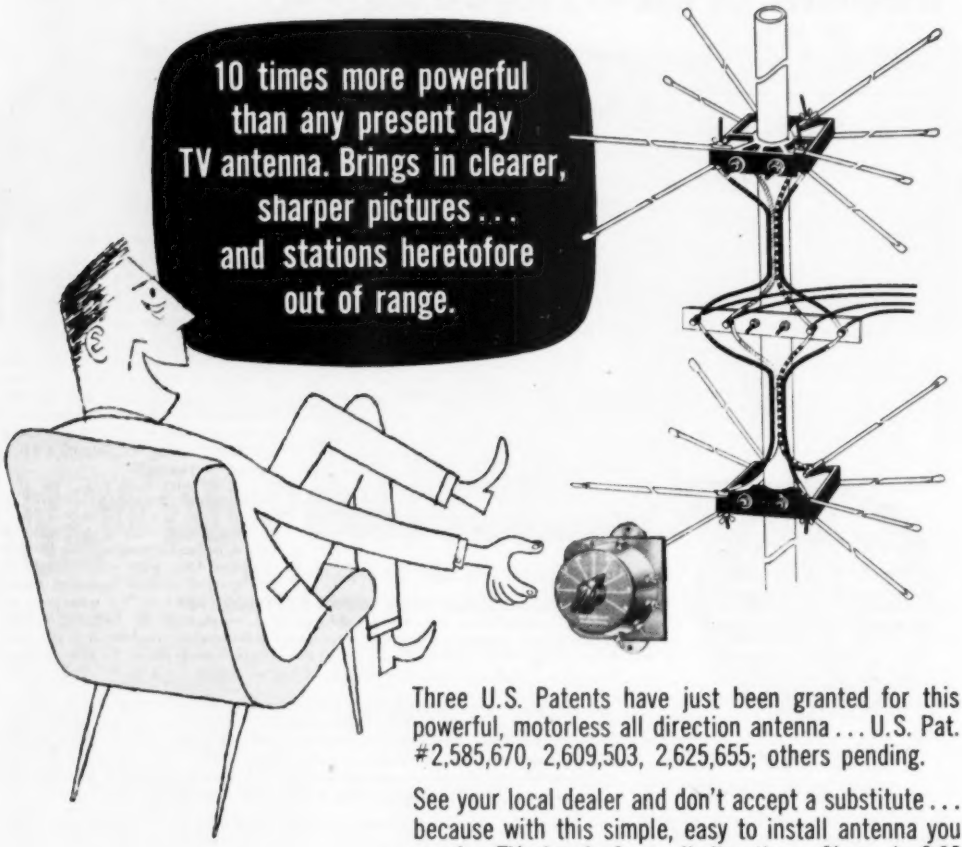
Clip Coupon . . . Mail TODAY!

LaSalle Extension University . . . *A Correspondence Institution*
Dept. 583-H, 417 S. Dearborn Street, Chicago 5, Illinois

YES, I want to see how LaSalle's "Problem Method" works.. how I can qualify for high-pay Accountancy positions. Send Free Sample Lesson — also your 48-page book, "Accountancy, the Profession That Pays" ...all without cost or obligation.

Name..... *Age*.....
Street Address.....
City, Zone & State.....
Present Position.....

If you had a million dollars you couldn't buy a better antenna!



Three U.S. Patents have just been granted for this powerful, motorless all direction antenna . . . U.S. Pat. #2,585,670, 2,609,503, 2,625,655; others pending.

See your local dealer and don't accept a substitute . . . because with this simple, easy to install antenna you receive TV signals from all directions, Channels 2-83 UHF and VHF, without a rotor.

Actually 9 different antennas in one!

The 9 position switch located near the television set . . .
instantly and electronically beams the antenna to the direction of the best possible reception.

LIST PRICE
$36.50

ALL CHANNEL ANTENNA CORP.
70-07 Queens Blvd., Woodside, New York

Includes Stacked Antenna Array. 9 Position Switch. Completely Wired Stacking Harness. A.I.M.—Automatic. Impedance Matching Coupler.

Yours ALMOST AS A Gift!

ONLY 25¢ FOR THIS VALUABLE U. S. COMMEMORATIVE SET OF

30 History IN THE Making STAMPS

Guaranteed to be Worth THREE Times as Much!

GENERALS—Portraits of 3 famous Civil War Generals—U. S. Grant, Sheridan, and Sherman. Color, purple.

COMMEMORATES centenary of first stamps issued by U. S. Pictures Washington and Franklin. Color, blue.

FOUR CHAPLAINS—Honors 4 chaplains who sacrificed lives in sinking of SS Dorchester in World War II. Color, black.

FREEDOM—Pictures Statue of Liberty and Jos. Pulitzer, famous exponent of freedom and press. Color, purple.

FRANCIS SCOTT KEY—Pictures famous author of our national anthem, *Star Spangled Banner*. Color, red.

CIVIL WAR—Adm. Farragut and his foster-father, Comm. Porter, led opposing forces. Color, purple.

OLD IRONSIDES—Stamp commemorates 150th anniversary of launching of Frigate Constitution. Color, green.

OLDEST U. S. COMMEMORATIVE STAMP (issued 1893) pictures landing of Columbus. Color, purple maroon.

MAIL COUPON TO GET THESE 8 STAMPS

PLUS 22 Other Great U. S. Stamps on this Amazing Offer!

MAIL coupon at once. We'll send you this fascinating set of 30 famous historic U. S. stamps—ALMOST AS A GIFT! All different. Each stamp tells a real, exciting story about an important event in American history. Each stamp is worth REAL MONEY. Our supply is limited. So please don't ask for more than one set.

FREE 32-Page Book

In addition to these 30 commemorative stamps, we'll also include other interesting offers for your inspection — PLUS a FREE copy of our helpful, informative book, "How to Collect Postage Stamps." Contains fascinating and true stories such as the one about the 1¢ stamp (which a schoolboy sold for $1.50) and which was later bought for FORTY THOUSAND DOLLARS.

Free book also contains expert advice on collecting: how to get started; where and how to find rare stamps; how to tell their real value; how to mount them, trade them; how to start a stamp club; exciting stamp games, etc. It has pictures galore! Full pages of pictures showing odd stamps depicting natives from far-away lands; ferocious beasts, etc.

MAIL COUPON TODAY

Be the first in your neighborhood to have this valuable set of stamps. Your friends will envy you for it and want to buy the set from you. It will become one of the most prized sets of any stamp collection. But you must hurry. This special offer may have to be withdrawn soon. Rush coupon NOW!

If coupon has already been clipped, send 25¢ DIRECT to:

LITTLETON STAMP COMPANY
Dept. 5-PS, Littleton, N. H.

Free

If you mail coupon AT ONCE, we will send you, *free*, this fascinating booklet. Supply limited. So rush coupon NOW!

Littleton Stamp Co.,
Dept. 5-PS, Littleton, N. H.

I enclose 25¢. Please send set of 30 historic U. S. Stamps. Also send FREE—while supply lasts—the fascinating booklet, "How to Collect Postage Stamps."

Name.....

Address.....

City.....Zone.....State.....

Letters

More Attention to Safety

As an instructor of Driver Education, I read PSM's auto reports with great interest. However, I am most concerned about the driving public's attitude toward speed and safety. In every auto report we read about higher top speeds, greater pickup, more horsepower. I think it's valuable information, but only as sensibly used is it safe. Unfortunately, many drivers don't take the expert's word, but go out and see for themselves. With so many autos on the highways and the death rate climbing, the motorist needs to understand better the power he has under the hood. How about pointing up proper use of the information and more attention to automobile safety factors?

EDWARD MYSLIVECEK, Garden City, N. Y.

Please see page 81.

The Low-Down on Clearance

I'd like to know which of the new, low-priced autos has the greatest road clearance.

JOSEPH OVNICK, Forest City, Pa.

Road clearance of Ford, Chevrolet, and Plymouth does not vary more than two-tenths of an inch. Minimum clearance at the exhaust pipe is about 7", and clearance at the differential is about 8".

Exception Sustained

I think you gave Randall Cowles a bum steer in your Letters column a while back when you said that water and permanent-type antifreeze would keep a car engine the same temperature if the cooling-system ther-

NEWS from SCIENCE
ABOUT YOUR HAIR

Laboratory discovery outdates messy hair oils!

"V-7," completely new *greaseless* grooming agent, now in Vitalis Hair Tonic. It's *not* an animal, vegetable or mineral oil!

Hair stays neat all day

No gummy film, no oily or matted-down look with new Vitalis!

Kills dandruff germs, too!

New Vitalis kills *on contact* germs many doctors associate with infectious dandruff. Feels *"tingling good"* on scalp!

NEW FINER
VITALIS®
HAIR TONIC
WITH "V-7"

Product of Bristol-Myers

YOU PRACTICE COMMUNICATIONS with Kits I Send You

Build This Transmitter

As part of my Communications Course I send you parts to build the low power Broadcasting Transmitter shown at the right. Use it to get practical experience putting a station "on the air," perform procedures required of Broadcast Station operators. You build many other pieces of equipment with kits I send. I train you for your FCC Commercial Operator's License.

You Get Valuable, Practical Experience Using My Kits. All Equipment Yours to Keep.

YOU PRACTICE SERVICING with Kits I Send You

Build This Tester

You build this Multitester from parts I send, use it to earn extra money in your spare time fixing neighbors' Radios. I also send you speaker, tubes, chassis, transformer, loop antenna, everything you need to build a modern Radio and other equipment. You get practical experience working with circuits common to both Radio and Television. All equipment is yours to keep. See and read about it in my FREE 64-page book. Just cut out and mail coupon below!

J. E. Smith has trained more men for Radio-TV than any other man.

I Will Train You at Home to be a RADIO-TELEVISION Technician

TELEVISION Today's Good Job Maker

TV now reaches from coast-to-coast. Over 15 million TV sets are now in use; 108 TV stations are operating and 1800 new TV stations have been authorized. This means more jobs, good pay jobs with bright futures. Now is the time to get ready for success in TV. Find out what Radio-Television offers you. Mail coupon now for my 2 Books FREE!

America's Fast Growing Industry Offers You Good Pay, Success

Do you want a good pay job, a bright future, security? Then get into the fast growing RADIO-TELEVISION industry. Hundreds I've trained are successful RADIO-TELEVISION TECHNICIANS. Most had no previous experience, many no more than grammar school education. Keep your job while training at home. Learn RADIO-TELEVISION principles from easy-to-understand lessons. Get practical experience on actual equipment you build with parts I send you.

Make Extra Money in Spare Time While Training

The day you enroll I start sending you SPECIAL BOOKLETS that show you how to service neighbors' Radios in spare time while training. Use MULTITESTER you build to help service sets, get practical experience working on circuits common to both Radio and Television. Find out how you can realize your ambition to be successful in the prosperous RADIO-TELEVISION industry. Even without Television, the industry is bigger than ever before. 105 million home and auto Radios, over 2900 Radio Stations, expanding Aviation and Police Radio. Micro-Wave Relay, FM and Television are making opportunities for Servicing and Communications Technicians.

Mail Coupon — Find Out What Radio-TV Offers You

Send for my FREE DOUBLE OFFER. Cut out and mail coupon below. Send in envelope or paste on postal. You will get actual Servicing Lesson to prove it's practical to learn at home. You'll also receive my 64-page Book, "How to Be a Success in Radio-Television." Read what my graduates are doing, earning, see photos of equipment you practice with at home. J. E. Smith, President, Dept. 3EB National Radio Institute, Washington 9, D. C.

I TRAINED THESE MEN

Has Growing Business

"I am becoming an expert Telstrician as well as Radiotrician. Without your practical course I feel this would have been impossible. My business continues to grow." —Philip G. Brogan, Louisville, Ky.

Good Job with Station

"I am Broadcast Engineer at WLPM. Another technician and I have opened a Radio-TV service shop in our spare time. Big TV sales here. As a result we have more work than we can handle." —J. H. Bangley, Jr., Suffolk, Va.

Praises NRI as Best Course

"I was a high school student when I enrolled. My friends began to bring their Radios to me. I realized a profit of $200 by the time I completed the course."—John Hopper, Nitro, West Va.

AVAILABLE to all qualified VETERANS UNDER G.I. BILLS

NRI Training Leads to Good Jobs Like These

Broadcasting: Chief Technician, Chief Operator, Power Monitor, Recording Operator, Remote Control Operator, **Servicing:** Home and Auto Radios, P.A. Systems, Television Receivers, Electronic Controls, FM Radios. **In Radio Plants:** Design Assistant, Transmitter Design Technician, Tester, Serviceman, Service Manager. **Ship and Harbor Radio:** Chief Operator, Assistant Operator, Radiotelephone Operator. **Government Radio:** Operator in Army, Navy, Marine Corps, Coast Guard; Forestry Service Dispatcher, Airways Radio Operator. **Aviation Radio:** Transmitter Technician, Receiver Technician, Airport Transmitter Operator. **Television:** Pick-up Operator, Voice Transmitter Operator, Television Technician, Remote Control Operator, Service and Maintenance Technician.

Tested Way to Better Pay

Good for Both - FREE

MR. J. E. SMITH, President, Dept. 3EB
National Radio Institute, Washington 9, D. C.

Mail me Sample Lesson and 64-page Book, FREE. (No salesmen will call. Please write plainly.)

Name ..... Age .....

Address .....

City ..... Zone ..... State .....

VETS write in date of discharge .....

Quietest Tread on Earth
Outgrips, Outwears them all!

ARMSTRONG
Rhino Flex
PREMIUM

● **FOUR EXCLUSIVES** give safety, silence, comfort found in no other tire. **(1) Interlocking Safety Tread** for greater "hold" in all directions. **(2) Silent Traction Design** cancels out hum. **(3) Intra-Tread Bumpers** hold tread ribs apart, muffle squeal. **(4) Uni-Cushion Contour** —more rubber on road for smoother riding, longer wear.

UNCONDITIONALLY GUARANTEED 3 YEARS!

Unserviceable tire will be replaced by comparable new tire with full credit for the period of guarantee not realized.

FREE! Armstrong's handy 88-page Road Atlas-Radio Guide! Send 10¢ to cover postage. Dept. P-1. Armstrong Rubber Company, West Haven 16, Conn.

mostat was functioning properly. Under conditions frequently encountered in high-altitude or desert driving, water will make the car run cooler. Here's why:

On reaching its boiling point, which may be 190 degrees on a hot day at high altitude, water will begin to cool both by evaporation and by conduction. At the same temperature, permanent-type antifreeze will cool by conduction only, since its boiling point is 387 degrees.

MYRON DRAGISICT, Lakewood, Ohio.

Living off and on the Planets

In view of the usual high quality of PSM, I was surprised at your lack of taste in publishing "They Are Living off Another Planet" [Jan., p. 132]. I feel that you should not

devote space to utter fantasies but use your pages for the presentation of facts.

ALAR TOOMRE, NYC.

Our article was printed as a success story about an imaginative artist and writer who are cashing in on the current interest in space travel. It was not intended as an endorsement of their obviously fictional astronomical theories.

"Does Anybody Live on Mars" [Feb., p. 126] is the kind of reading I like. It stimulates the imagination. The possibility that the Martians have been driven inside their planet seems to me to be an answer to the lack of evidence of life on the surface.

NOBLE E. PEELER, St. Paul, Minn.

Ouch! Editor Trips Over Tack

"Yesterday's words often become obsolete today," warned the introduction to the Hot-Rod Dictionary [Dec., p. 185], "and we must warn the reader that some of these may have snuk into the present work."

Apparently one did. In "How to Build a Rev Counter" [same issue, p. 174] the term "tach" was used. In the Hot-Rod Dictionary it was "tack."

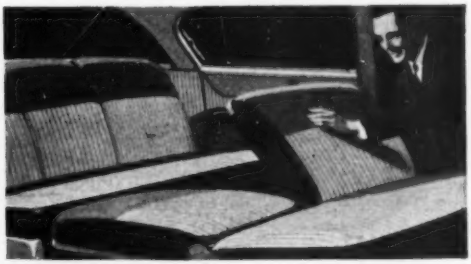
EDWARD MACDONALD, Seattle.

Our style, barring snuk-ins, is "tach."

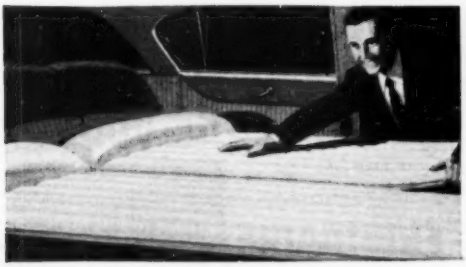
Do You Know?

How Nash Airliner Reclining Seats Turn into Twin Beds in 30 Seconds?

1 At lever touch either front seat back adjusts to any of five comfortable positions. Right-hand seat, fully reclined, makes a wonderful "couch" for children's or passenger's naps.



2 No longer need the driver sit rigidly in one position. Just touch a lever and change the angle of the seat back. Tall men say it's the greatest idea yet for comfort on long drives.



3 All the comforts of home! Your Nash dealer offers easy-to-inflate air mattresses and special window screens at small cost—providing a wonderful home on the road for you.

4 Twin Beds in 30 seconds! Both front seat backs recline to fill space between front and rear seats, creating roomy Twin Beds for hunters, fishermen—everyone who travels.

Reclining Seats and Twin Beds are just two of the scores of exclusive Nash features available. See and drive the new 1953 Airflytes, styled by Pinin Farina, at your Nash dealer's. Take the key and see—"there's none so new as Nash for 1953."

Nash Motors, Division Nash-Kelvinator Corporation, Detroit, Mich.

shake it on every morning then...

every step of the day

QUINSANA FIGHTS ATHLETES FOOT INFECTION

QUINSANA works full-time—and *fast!* 9 out of 10 report amazing results.

91% of foot specialists interviewed used it on their patients.

For burning, itching feet—cracking, peeling skin . . . get QUINSANA quick!

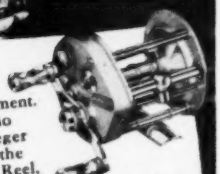
Soothes, cools tired feet!

PFLUEGER

Supreme REEL

Prized Reel OF SUCCESSFUL ANGLERS

People who excel in any sport insist on the finest equipment. In fishing there's no substitute for Pflueger performance. Get the feel of a Supreme Reel, and enjoy better fishing. Ask your dealer.



$35.00

THE ENTERPRISE MFG. CO., AKRON, OHIO

89 years making fine fishing tackle

PFLUEGER

(Pronounced "FLEW-GER")

A GREAT NAME IN TACKLE

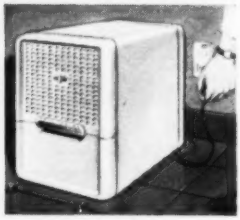
STOP MOISTURE DAMAGE FOR GOOD!

Just plug in the amazing

FRIGIDAIRE

Electric Dehumidifier

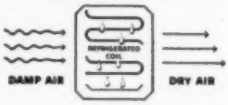
Only 18¼" high—20½" long—11¾" wide



Positively controls moisture in any closed area up to 8,000 cu. ft. where moisture is a problem.

Fan circulates moisture-laden air over refrigerated coil. Moisture is condensed and collected in container. May be connected to drain. Dry, filtered air flows into room.

HOW DEHUMIDIFIER WORKS



See your Frigidaire Dealer now. Or write for free folder to Frigidaire, Dept. 2094, Dayton 1, Ohio. In Canada, Toronto 13, Ont.

Built and backed by General Motors

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

CLARENCE A. O'BRIEN & HARVEY JACOBSON

Registered Patent Attorneys

32-E DISTRICT NATIONAL BUILDING

WASHINGTON 5, D. C.

Build A FIREPLACE

around this scientifically designed steel form which also provides circulating heat and assures perfect Fireplace operation.

free folder tells how

TELLS HOW TO BUILD YOUR FIREPLACE—*Step by Step*

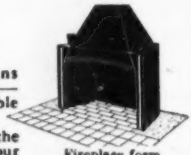
- Foundation
- Steel heat-circulating form
- Cold and warm air ducts
- Chimney and flue construction
- Mantel or decorative front

Foundation

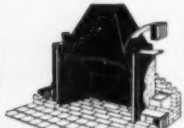
ASK FOR BOOK "100 FIREPLACE IDEAS"

Beautiful fireplace designs modern and conventional—shows artistic use of available material.

Enjoy circulating heat and the radiance of an open fire in your *Home, Playroom, Cottage or Camp.*



Fireplace form set on foundation includes firebox, damper, down draft shelf and smoke dome.



Brick, stone or cement block can be used around the form.

- ☐ Send free directions for building heat-circulating fireplace.
- ☐ Send Book "100 Fireplace Ideas." Pocket size book, sent free.
- ☐ Send larger book, 8½ x 11, beautifully illustrated, 25c.
- ☐ Send outdoor fireplace folder with 10 beautiful designs Free.

Name .....

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Sold Through Leading Building Materials Dealers

PRICE FIREPLACE HEATER & TANK CORP.
192 W. Austin Street, Buffalo 7, New York

MONTH AFTER MONTH, YEAR AFTER YEAR, YOU SEE OUR AD. CHECK AND DOUBLECHECK BEFORE YOU BUY ANYWHERE!
1 Are these tires "Family-Safe"? Our families use them.
2 Are They Recaps? Ours are not (except passenger Snow-Tires)
3 Will I get Goodyear, U.S. & famous Brands? From Us, You Must!
4 Is the guarantee unconditional? See our fine offers below.
5 Can good tires be bought cheaper? It's dangerous to pay less.
6 Is a tube included free? Yes, we do. See OUR Free Tube Offer.

GOODYEAR Firestone

GOODRICH, U.S. & OTHER USED TIRES. (NO NOT RECAPS) DOUBLE WARRANTY & UNCONDITIONAL GUAR. ON PASS. TIRES

Our policy is to select your tires so carefully, as if our very future depended on the service given by that particular tire.

FREE TUBE WITH EVERY GOOD GRADE, AND FINEST GRADE PASSENGER AND TRUCK TIRE.

GOOD GRADE 20 MONTHS GUARANTEE BOND

600-16	$4.02	820-15	$5.30	600-20	$6.92	32x6(8)	$8.50
650-16	4.40	700-15	4.22	650-20	7.52	32x6(10)	9.80
700-16	5.00	670-15	4.40	700-20	8.40	900-20	13.10
650-15	4.00	710-15	4.60	750-20	8.40	1000-20	13.62
760-15	4.90	550-19	6.54	825-20	13.92	1100-20	13.94

FINEST GRADE, 30 MONTHS GOLDEN RULE GUARANTEE BOND
THIS GRADE MADE THE "BLATT" NAME WORLD FAMOUS

600-16	$5.12	700-15	$5.32	30 MONTH GUAR. TRUCK TIRES			
600-16 FA	$7	475-19	5.85	700-15(6)	$9.92	700-20	$12.52
650-16	5.92	640-15	5.82	750-16(6)	$10.92	750-20	12.92
650-16(6)	7.92	670-15	5.22	825-15	18.36	750-20(10)	17.52
700-16	6.52	710-15	5.72	750-15	13.22	825-20	18.22
700-16(6)	8.72	760-15	5.92	750-16(8)	13.82	900-20	17.22
750-16	7.02	800-15	6.62	700-18	15.82	1000-20	18.52
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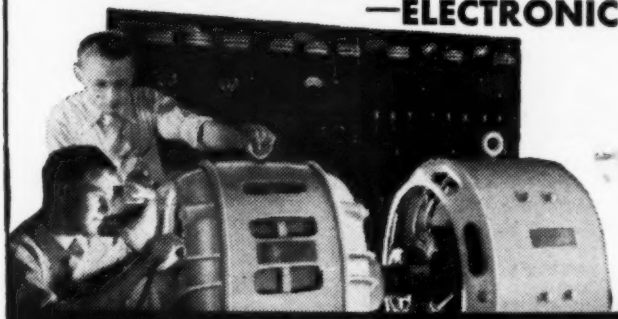

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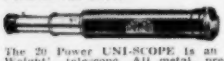

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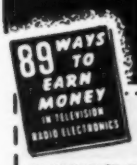

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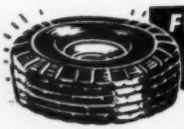

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Ordinarily, a man can get along without a high school diploma. Plenty of men have. But not in the Navy. At least not in the U. S. Navy Materiel School at Bellevue, D. C., back in 1929. In those days a bluejacket had to have a mind like Einstein's. And I didn't.

"Godfrey," said the lieutenant a few days after I'd checked in, "either you learn mathematics and learn it *fast* or out you go. I'll give you six weeks." This, I figured, was it. For a guy who had to take off his shoes to count above ten, it was an impossible assignment.

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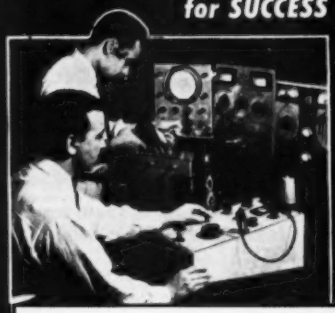

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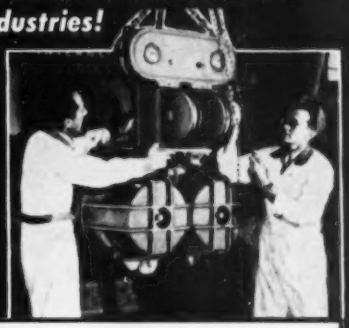

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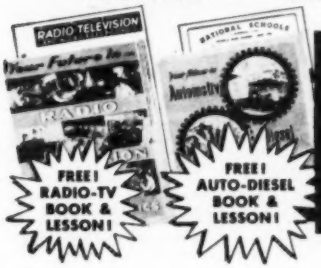

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1214 CHOPIN—Etude in E Minor; Mazurka in F Sharp Minor; Etude in E Minor; Prelude No. 18; etc.
1244 PIANO ENCORES—Rhapsody in Blue etc.
1201 STRAUSS WALTZES—Berlin Symphony Orchestra
1202 VIENNESE WALTZES—Berlin Symphony Orchestra
1245 VIOLIN ECHOES OF VIENNA—Caprice Viennois; Liebesleid; Tambourin Chinois; Liebestraud; La Gitana; Rondo; Danube Waves; Czardas;
1381 MYSTERIOUS MUSIC OF ROMANCE
1336 AN HOUR OF POPULAR FAVORITES—Begin the Beguine; Dancing in the Dark; etc.
1332 AN HOUR OF COLE PORTER TUNES
1336 AN HOUR OF OPERETTA INSTRUMENTALS
1337 AN HOUR OF GEORGE GERSHWIN
1343 AN HOUR WITH IRVING BERLIN
1345 LATIN HOUR WITH NORO MORALES
1318 AN HOUR OF CONCERT SONGS
1374 AN HOUR OF STAR DUST—A POP CONCERT
1385 AN HOUR OF PIANO DANCE MUSIC
1396 AN HOUR OF MODERN PIANO RHYTHMS
1377 DANCE PARTY Rumba—Tango—Samba—Beguine—Bamba—Conga— Mambo Fox Trot—Charleston—Polka—American Waltz —Viennese Waltz—One Step—Rest—
1215 PIANO MELODIES OF CHOPIN and DEBUSSY
1227 MUSIC OF THE BALLET
1216 TSCHAIKOWSKY MUSIC
1217 GRIEG PROGRAM
1346 PROKOFIEV—Peter and the Wolf
DEBUSSY—Children's Corner Suite
1209 STRAUSS—Till Eulenspiegel; SIBELIUS—Finlandia; BACH—Brandenburg Concerto No. 4
1344 STRAUSS, R.—Don Juan and Other Selections
1313 DEBUSSY—Afternoon of a Faun
RAVEL—Bolero
1380 GREIG—Peer Gynt Suites No. 1 & 2
1294 KHACHATURIAN—Gayne Ballet Suite
RIMSKY—KORSAKOFF—Capriccio Espagnol
1283 MOUSSORGSKY—Pictures at an Exhibition
1357 HOUR WITH TSCHAIKOWSKY
1378 HOUR WITH RICHARD STRAUSS
1371 HOUR WITH FRANZ SCHUBERT
1402 AN HOUR OF THE MASTER PIANISTS Famous Selections
1399 AN HOUR WITH WAGNER
1398 THE HEART OF THE BALLET
1396 AN HOUR OF YOUR FAVORITES Donkey Serenade; September Song, etc.
1394 CONCERT HOUR Dance of the Hours; The Merry Wives; etc.
1405 AN HOUR WITH ARTIE SHAW
1408 AN HOUR OF SONGS OF AMERICA

OPERA

1278 JAN PEERCE and MARIAN ANDERSON Recital
1204 CARMEN (Bizet)—The Complete Arias
1286 AIDA (Verdi)—Arias
LA TRAVIATA (Verdi)—Overture and Arias
1308 THE BARBER OF SEVILLE (Rossini)—The Arias
1256 TENOR ARIAS—Rudolph Schock with Berlin Opera Orch.
1210 THE MARRIAGE OF FIGARO (Mozart)—Arias
1211 LUCIA DI LAMMERMOOR (Donizetti)—Arias
1322 OFFENBACH: TALES OF HOFFMANN (Excerpts)
1323 HEART OF THE OPERA
1349 RIGOLETTO (Verdi) Excerpts
1350 CAVALLERIA RUSTICANA (Mascagni) Excerpts
1352 DER ROSENKAVALIER (Strauss) Excerpts

CONCERTOS

1376 BEETHOVEN—Piano Concerto No. 1 in C
1304 BEETHOVEN—Piano Concerto No. 3 in C Minor, Op. 37
1305 BEETHOVEN—Piano Concerto No. 4 in G, Op. 58
1306 BEETHOVEN—Piano Concerto No. 5 in E Flat
1307 BEETHOVEN—Violin Concerto in D, Op. 61
1359 BRAHMS—Piano Concerto No. 1 in D Minor
1252 BRAHMS—Violin Concerto in D Major, Op. 77
1253 CHOPIN—Piano Concerto No. 1 in E Minor, Op. 11
1340 CHOPIN—Piano Concerto No. 2
1330 FRANCK—Symphonic Variations for Piano and Orch.
LISZT—Piano Concerto No. 1 in E Flat
1264 GRIEG—Piano Concerto in A Minor
1276 KHACHATURIAN—Concerto for Piano and Orch.
1367 BACH—Violin Concerto No. 2 in E—Brandburg No. 2
1372 BACH—Brandenburg Concerto No. 5 & No. 6
1381 BOCCHERINI—Cello Concert in B Flat
BRAHMS OVERTURES—Academic Festival & Tragic
1363 DVORAK Cello Concerto in B Minor
1279 LALO—Cello Concerto
1287 LALO—Symphonie Espagnole, Op. 21
1383 LISZT—Piano Concerto No. 2, etc.
1221 MENDELSSOHN PIANO CONCERTO No. 1 in G Minor
MIDSUMMER NIGHT'S DREAM—Prelude; Scherzo; etc.
1286 MENDELSSOHN—Violin Concerto in E Minor, Op. 64
1341 MOZART—Piano Concerto in D Minor KV. 466
1329 MOZART—Piano Concertos, No. 12; 2—Piano E Flat
1339 PAGANINI—Violin Concerto No. 1
CHAUSSON—Poeme
1316 RACHMANINOFF—Piano Concerto No. 2 in C Minor
1373 SAINT-SAENS—Piano Concerto No. 2
1358 SCHUMANN—Piano Concerto in A Minor
1312 SCHUMANN—Cello Concerto in A Minor Op. 192
1261 TSCHAIKOWSKY—Piano Concerto No.1
1265 TSCHAIKOWSKY—Violin Concerto in D Major
1272 HEART OF THE PIANO CONCERTO—Excerpts from Grieg; Chopin; Tschaikowsky & Mendelssohn concertos
1315 HEART OF THE CELLO CONCERTO—Dvorak; Lalo; Schumann
1314 HEART OF THE VIOLIN CONCERTO

COMPLETE SYMPHONIES

1302 BEETHOVEN: Symphony No. 1 in C Major, Op. 21
1251 BEETHOVEN: Symphony No. 2 in D Major, Op. 36
1218 BEETHOVEN: Symphony No. 3 in E Flat "Eroica"
1243 BEETHOVEN: Symphony No. 4 in B Flat, Op. 60
1219 BEETHOVEN: Symphony No. 5 in C Minor, Op. 67
1225 BEETHOVEN: Symphony No. 6 in F Major, Op. 68
1303 BEETHOVEN: Symphony No. 7 in A Major, Op. 92
1240 BEETHOVEN: Symphony No. 8 in F, Op. 93
1367/8 BEETHOVEN: Symphony No. 9 in D Minor (Choral) Berlin Symphony Orch. and Cathedral Choir—Conductor Gerd Rubahn. 2 Record Set.
1325 BERLIOZ: Symphonie Fantastique
1237 BORODIN: Symphony No. 2 in B Minor
1289 BRAHMS: Symphony No. 1 in C Minor, Op. 68
1232 BRAHMS: Symphony No. 3 in F Major, Op. 90
1239 BRAHMS: Symphony No. 4 in E Minor, Op. 98
1317 DVORAK: Symphony No. 4 in G, Op. 88
1257 DVORAK: Symphony No. 5 in E Minor (New World)
1298 FRANCK: Symphony in D Minor
1337 HAYDN: Symphony No. 92 "The Oxford"
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1356 HAYDN: Symphony No. 101 in D "Clock"
1329 HAYDN: Symphony No. 103 "The Drum Roll"
1385/6 LISZT: A Faust Symphony & Festlongo—2 Records
1308 MAHLER: Symphony No. 4 in G Major
1330 MENDELSSOHN: Symphony No. 3 "The Scotch"
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1309 MOZART: Symphony No. 39 in E Flat, kv543
1222 MOZART: Symphony No. 40 in G Minor
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1260 RIMSKY-KORSAKOFF: Scheherazade
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1220 SCHUBERT: Symphony No. 8 in B Minor "Unfinished"
1334 SCHUMANN: Symphony No. 1 in B Flat
1361 SCHUMANN: Symphony No. 2 in C Major, Op. 61
1366 SCHUMANN: Symphony No. 3 in E Flat "Rhenish"
1234 SCHUMANN: Symphony No. 4 in D Minor, Op. 120
1258 SIBELIUS: Symphony No. 2 in D Major
1335 TSCHAIKOWSKY: Symphony No. 4
1224 TSCHAIKOWSKY: Symphony No. 5 in E Minor
1226 TSCHAIKOWSKY: Symphony No. 6 "Pathetique"
1347 THE HEART OF THE SYMPHONIES

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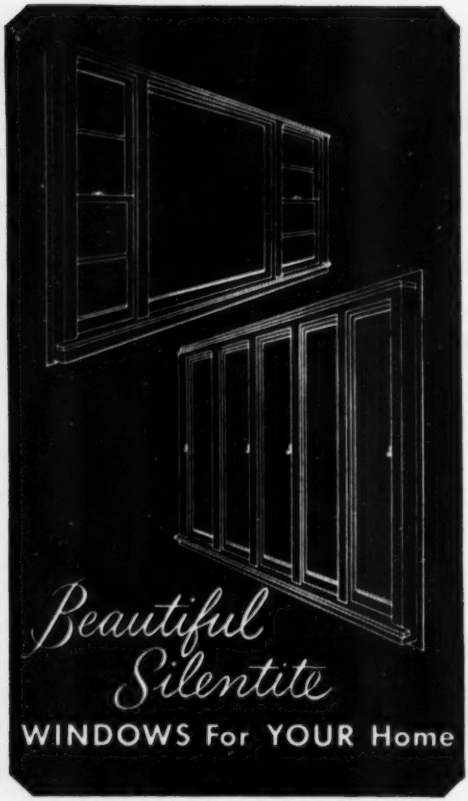

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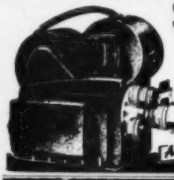

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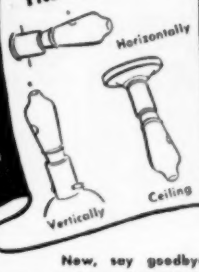

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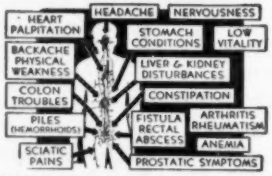

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Miss Stenz does not claim to grow hair in 20 minutes. The story, titled by Vue Magazine editors, deals with her demonstration—made many times, for many people—that even entirely "bald" heads often have considerable live hair, completely grown over by membraneous tissue, which ordinary scalp treatments do not penetrate. Microphotographs in the Vue article show that when this tissue is penetrated by a 20-minute Stenz treatment, hair may appear dramatically over a considerable portion of the formerly bare scalp. Other publications, too, have carried feature articles on the Stenz Hair Clinics—Time Magazine, New Liberty, Everybody's Digest, and newspapers coast to coast. Famous motion picture stars, including Dick Powell and James Stewart, are among those who enthusiastically credit her with saving their hair.

BALDNESS HEREDITARY? "BOSH" says Patricia Stenz

Although physicians generally consider baldness hereditary and incurable, many have proved their *personal* disbelief by turning to the Stenz Clinic for treatment. Miss Stenz insists that the idea of hereditary baldness is nonsense. "Baldness," she says, "is usually caused by a fungus, often starting in childhood. Early preventive methods might *eliminate* it altogether." Naturally the advanced disease is more difficult to correct, and Miss Stenz makes no unwarranted claims. She realizes that not every user has grown hair. Her worldwide clientele, however, is evidence to many that hope exists for those who give her method a fair trial.

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700-16	5.00	670-15	4.45	700-20	8.45	900-20	13.15
650-15	4.35	710-15	4.65	750-20	8.55	1000-20	13.75
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6[illegible]-16(6)	6.4[illegible]	640-15	5.05	750-16(8)	10.75	750-20(10)	15.
650-16	5.85	670-15	5.55	700-17	9.95	[illegible]-20(8)	15.05
650-16(6)	7.35	710-15	5.75	750-17	11.75	825-20	18.35
700-16	6.45	760-15	6.05	750-15	13.95	900-20	17.25
750-16	9.25	800-15	6.55	825-15	12.95	1000-20	17.75
525-18	5.00	820-15	6.65	600-20	8.75	1100-20	19.55
550-17	4.95	670-16	6.35	650-20	10.25	1000-22	19.45
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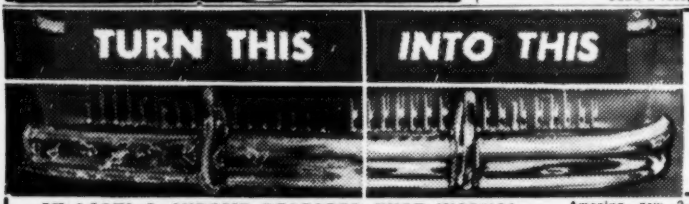

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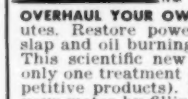

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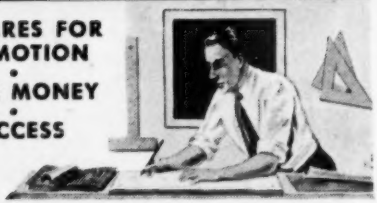

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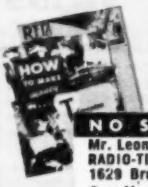

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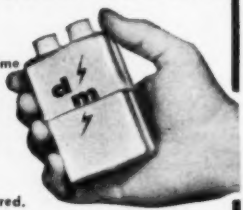

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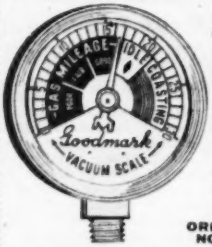

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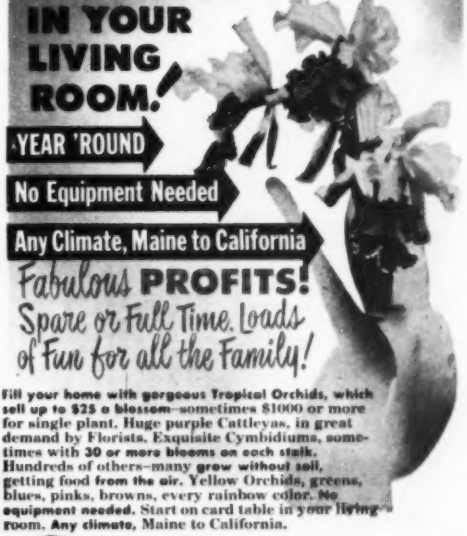

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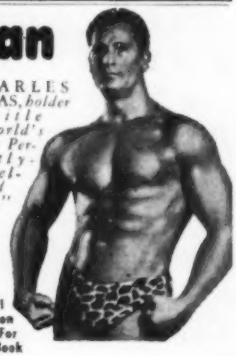

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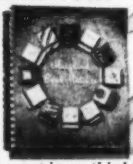

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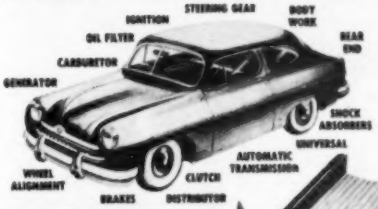

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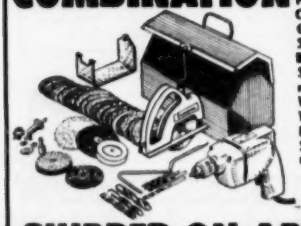

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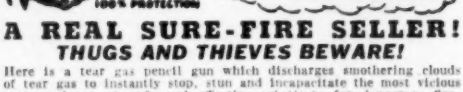

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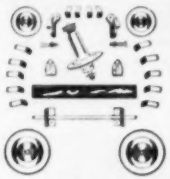

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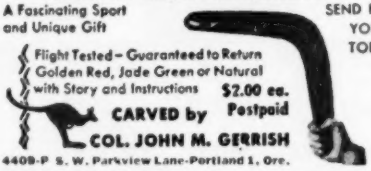

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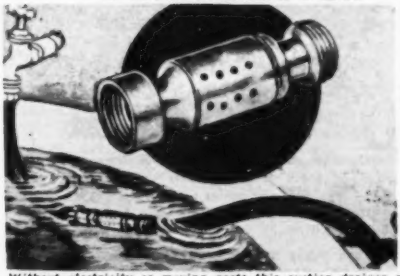

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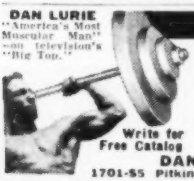

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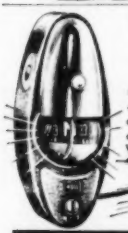

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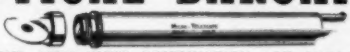

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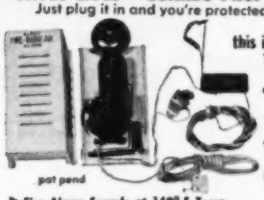

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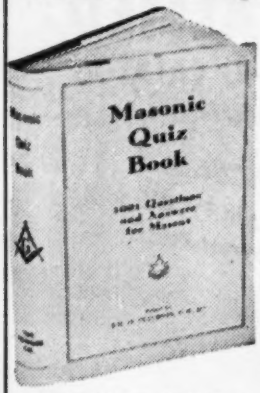

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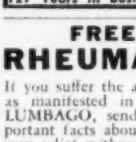

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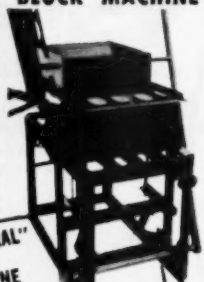

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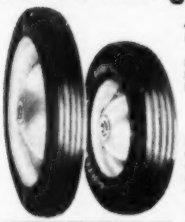

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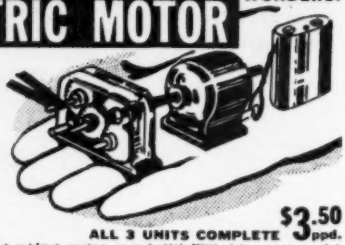

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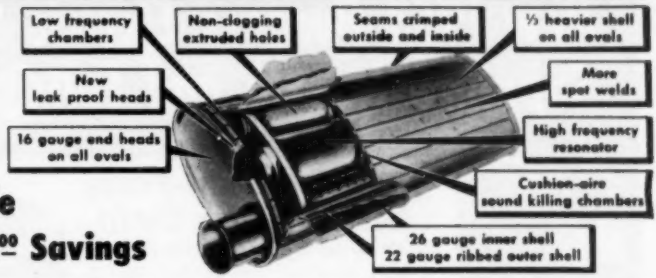

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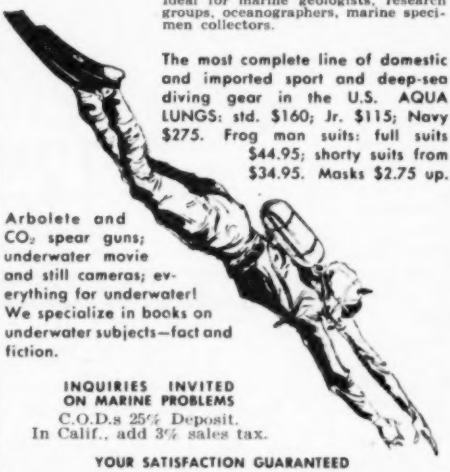

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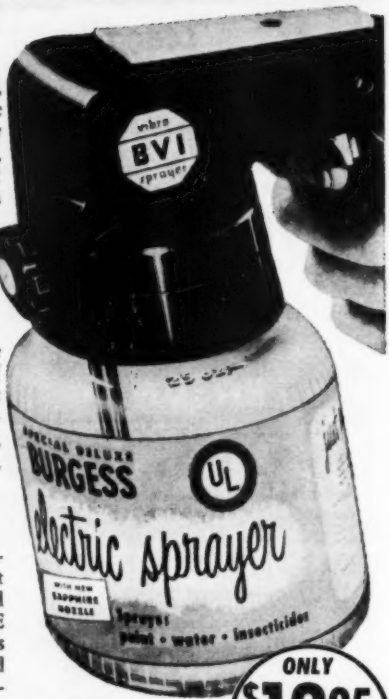

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29 ANTIQUES, RELICS

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HAVE Big Time Mail Business. Get ideas—help—inspiration from others who made fortunes. Fern, 513-B West 61st, Chicago 21, Illinois.

SELL Automobile Owners By Mail—needed items. Everything furnished. Big earnings. Eastern, Box 142-B, Boston 34, Mass.

SELL Religious Items By Mail—Millions of prospects. Big Profits. Everything Furnished. Literature Free. Kelley, Box 1315B, San Francisco, California.

BUY Wholesale—Thousands nationally advertised items. Save—Make Money! Free details. Durex Co., Box 672-W, Chicago, Illinois.

GET Into Profitable Mailorder Business Now. Write R. Jackson, Box 1018, Irving, Texas.

HOME Business Opportunity—Mailing literature—running ads offering fast selling repeat order merchandise. Everything furnished. Bonar, Box 134-B, Highland, O.

FRANCHISE Opportunities nationwide! Make no small plans! Secure exclusive distributorship or agency operation. Inquire today. National Franchise Reports, 452 Pure Oil Building, Chicago 1, Illinois.

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50 PLANS For Home Mail Business. Proven Money-Makers. Personal help assures success. Verdo, R. 1, Box 37-B, Huntsville, Missouri.

MAKE Money mailing cards; circulars. Pleasant; Profitable. Paton, Box 55-A, New York 23, N. Y.

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EARN money in your spare time, make and sell rhinestone jewelry. Easy to make and sell 100% profit. Free catalog. Eberts, Box 18J, E. Orange, New Jersey.

"EVERYBODY Likes Candy." Learn to make professionally. (Our 43rd year.) Ragsdale Candies, East Orange, New Jersey.

BOOKKEEPERS — Operate profitable "No-Ledger" bookkeeping service. Write Frye, Box 432, Chester, South Carolina.

WANT a new car?—fine clothes—more money? These can be yours! Complete home plans for making - selling many sought after articles. 50c (stamps unacceptable). No special ability needed. Profit unlimited. Send today! Master Skills, 118-S Ashland Avenue, River Forest, Ill.

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$15.00 THOUSAND, highest prices addressing envelopes at home—longhand, typewriter. Almon Torrey, Rowley, Mass.

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BOOKKEEPERS — Complete manual. "Eleven Plans For Establishing Successful Bookkeeping and Tax Service" with license to operate. Only $3.00. Commercial Business Service, 411 Fairfield Rd., High Point, North Carolina.

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FLORIDA Opportunities! Hundreds of jobs, businesses, farms, groves, ranches, homes. Free details! Florida Opportunity Bulletin, Box 456-N10, Coconut Grove, Miami 33.

PRINT Without A Printing Press. Big Money! See page 54.

1,000 DOLLAR—Making Tips! Free books! Mailcraft, Box 91, New York 60.

FIX typewriters. Free booklet describes our modern, inexpensive home-study course. Factory methods taught. Write Typewriter, Building 4, Tarentum, Penna.

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38 MONEYMAKING OPPS.

21 POPCORN, Candy Apple Formulas, proven money-makers. Send $1 today for formulas, catalog of money-making ideas. Concession Supply, 3916 Secor, Toledo, O.

DETECTIVES Earn Big Money. Experience unnecessary. Detective Particulars free. Wagoner, P-125 West 86th, N. Y. 24.

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41 CHEMICALS & APPARATUS

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CHEMICALS, Supplies, Catalog 15c. Laboratory Sales, Box 161-S, Brighton, Mass.

CHEMICALS and apparatus for industrial, analytical, and private laboratories. Catalog 25c. Dept M-26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

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42 HELP WANTED

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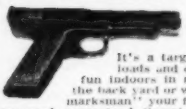

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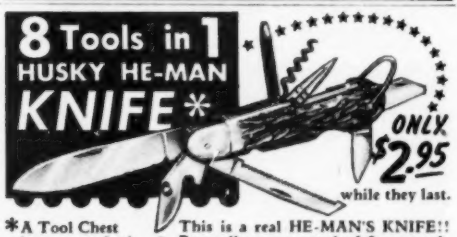

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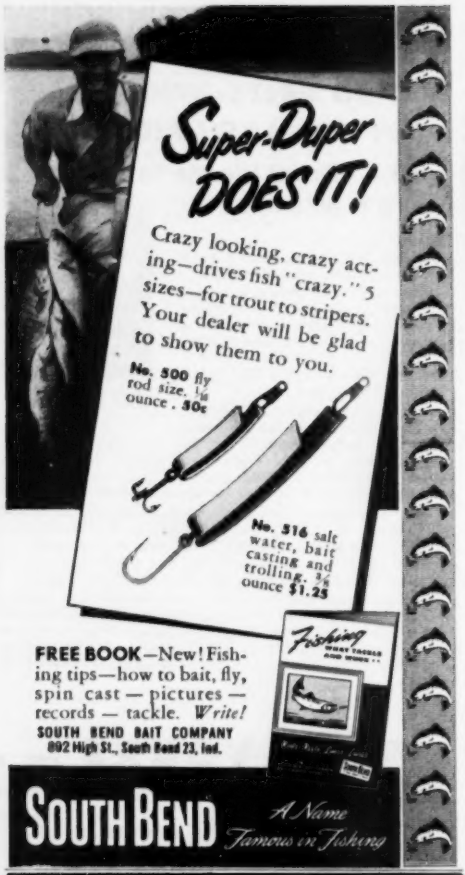

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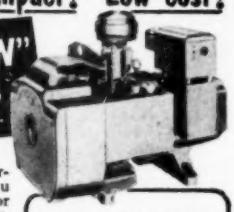

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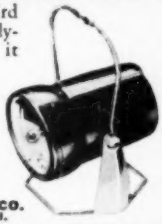

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FOR 1953
4 GREAT ALTERNATE FIRING TWINS

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**Prices f.o.b. factory, subject to change. Weights approx. OBC Certified brake hp at 4000 rpm.*

SUPERIOR PRODUCTION · SUPERIOR VALUE · ONE MILLION · JOHNSON OUTBOARD MOTORS

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POPULAR SCIENCE
HOW-TO-DO-IT-CO. Monthly

Will This Car Cure Teen-Age Drivers?

High-school kids have more smashups than any other age group. Now a new plan promises to cut the fearful toll.

RONALD CORBETT is a youngster of 17 who has set out to prove that a teen-ager at the wheel of a car is not necessarily poison to every other motorist on the road.

Ron Corbett is learning to drive. He is part of an experiment. The people in charge of the experiment hope that they can cut down the shameful accident toll among teen-age drivers—the highest by far in any

IN EXPERIMENT being watched nationwide, high-school students learn driving in classroom.

age group. The nub of the experiment is that Ron Corbett and several score of his classmates in the Brooklyn, N. Y., High School of Automotive Trades are learning to drive without cars. They are learning in immobile automobiles in a classroom.

These are the questions posed by the experiment, being watched by every high school in the United States:

Can classroom instruction cure the teen-age driving problem?

Can high-school students be taught to drive by simulation and obtain licenses after a brief familiarization period in a real car?

Will state motor-vehicle bureaus grant licenses on this basis?

The cars used by Ron Corbett and his fellow students are called Drivotrainers. A further development of the Roadometer described in POPULAR SCIENCE MONTHLY in May, 1951 (pp. 104-6), the Drivotrainer permits mass instruction by one teacher. That's the heart of the whole idea.

By the time the school year is over next month, Clarence Barger, the sole instructor, will have tried to teach upwards of 175 youngsters to drive in less than four months. And not once will he have to move from a chair in the rear of the classroom.

Solenoids Print Report Cards

Yet he knows exactly how each of his students is doing. He knows, for instance, whether Ronald Corbett is slow in putting on his brakes, lets his clutch up too fast after shifting gears or fails to work his electric turn signal before rounding a corner.

Instructor Barger has only to look at a chart, inked with symbols by an electric console containing 60 solenoids, to see how well his instruction is going over. Each of the 15 Drivotrainers is packed with microswitches. They are constantly telegraphing information to the console through electric cables, and can transmit 60 kinds of messages to the printing mechanism worked by the solenoids.

Instructor Barger seldom opens his mouth. Even his instruction is automatic. It's all flashed on a screen. Movies—in color—show Ron Corbett and his fellow students how to start the engine, release the emergency brake and pull away from the curb. Everything is visual. Words, where needed, appear as captions on the film.

INSTRUCTOR, at console, gets instantaneous record of each student's driving ability. Driving lesson is projected on movie screen at front of classroom by endless film feed (top) adapted to standard Ampro projector. Notches in film work microswitches that set up scoring circuits in proper sequence through a multichannel selector or stepping switch like the ones in a central-dial telephone office. Films (right) run five to nine minutes.

When one of the instruction films has been run through—there are 22 of them—the instructor is likely to say:

"Number ten—you hit your brake too late on that stop. Number seven—you killed your engine when the light turned green by letting out your clutch with your engine idling. Number thirteen—you ran the red light."

What Mass Training Means

Nobody can argue, either. It's all there in black-and-white.

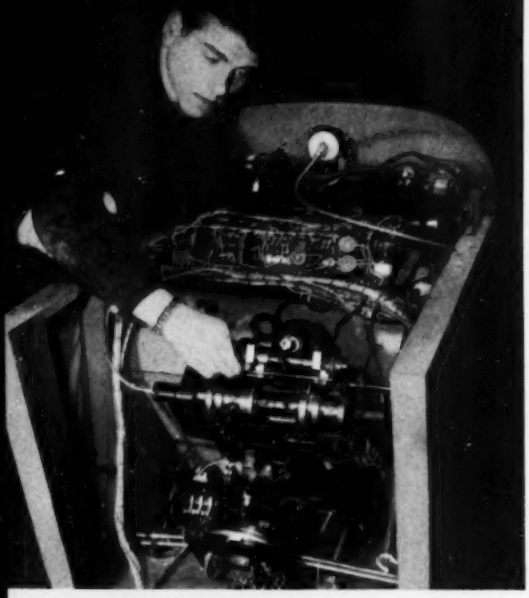
The people responsible for the free instruction are the New York City Board of Education and the Aetna Casualty and

Surety Company of Hartford, Conn. The company footed the bill for the training automobiles.

What mass training of young drivers could mean may be seen by contrasting this experimental class with conventional driver-training in the New York City high schools. Only one in 125 pupils now gets driving instruction paid for by the city. It's all the city can afford. And it isn't satisfactory. In the course of an hour, one instructor can teach a maximum of four youngsters. He takes them out on the city streets in a car. Each student gets only

TO BACK UP in Drivotrainer, Ron Corbett looks over right shoulder into mirror positioned to reflect road shown in movie. This provides view like rear window of real car.

"CAR" IS EQUIPPED with standard instrument group, lights, ignition key, starter button, choke, clutch, regular and emergency brakes, accelerator, turn signals and dimmer switch.



RON EXAMINES MACHINERY under hood. "Engine" is 1/60-hp. electric motor. Rheostat under accelerator governs its speed. Cams connected to gearshift lever change gear ratios.

10 to 12 minutes at the wheel. While that kid's driving, the others drape themselves over the back of the front seat, watching.

If youngsters are going to be taught how to drive properly—if the disproportionate number of accidents they are annually involved in is to be reduced—there has to be a better way to instruct them.

Instruction does pay off. In a recent survey of 1,500 high-school students in Massachusetts, those with no driver training at all were found guilty of 10 times as many traffic violations as those who did have training. In Evansville, Ind., only 21 percent of the youngsters with driver training had accidents as against 52 percent of those without training.

Teaches 72 Students for Six Weeks

Ron Corbett is being taught that good driving is more than learning to manipulate the controls of an automobile. Good driving is a matter of good judgment. If you're a dope, you pay the penalty. That's what this new kind of classroom instruction tells you.

Barger teaches six classes of 12 students each. He could handle nine classes of 15 students each day. Each period of instruction lasts 45 minutes. Each class meets five days a week for six weeks.

At the end of that time an 18-year-old student (that's the legal age-minimum for driving in New York City) is supposed to be able, with only brief familiarization at the wheel of a real automobile, to go out and pass a driving test.

Like any scientifically run experiment, this one has a control. To determine to what extent Drivotrainer instruction can replace actual road training, one group of students will receive one hour of supplemental instruction in a real automobile. A second group will receive one and a half hours, a third group two hours. The city's regular course of instruction in standard automobiles lasts eight hours.

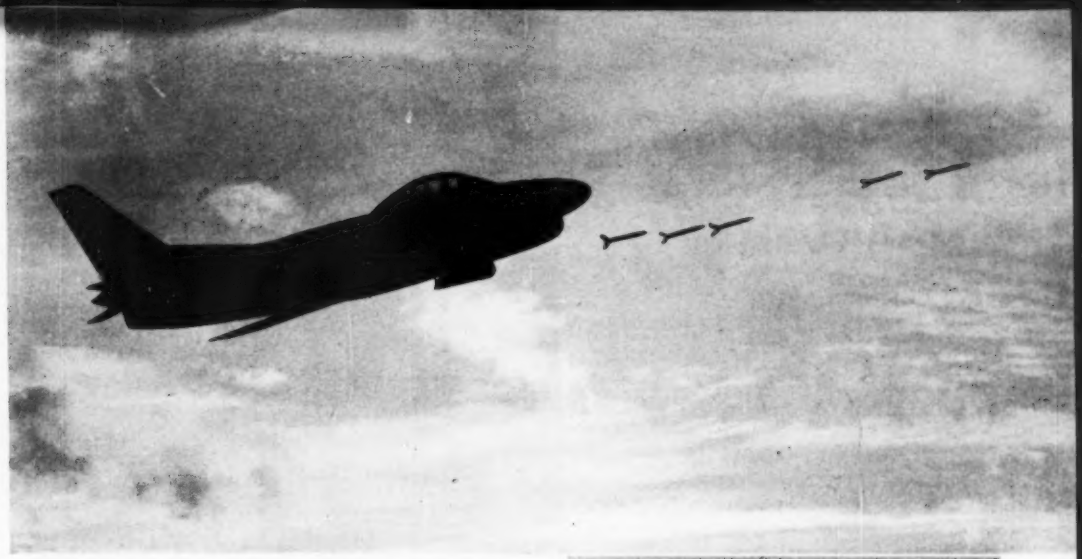
A report on this experiment will be issued early in 1954, covering the results of a year of training. It will be sent to every high school in the land. Before then Ron Corbett, who will be 18 on Oct. 21, will know how he came out.

Rebukes Student

The machine blabs everything, of course. On one of the days that a POPULAR SCIENCE reporter attended class, the instructor had to rebuke one student with, "You had your accelerator on the floorboard the whole time you were shifting gears. What are you trying to do,

[*Continued on page 244*]

SITTING IN FAMILY FORD beside his master-sergeant dad, Ron says, "This is how they teach us to shift into low or reverse—palm up, so we can't get into the wrong gear."



Belly-Pan Launcher Hides After Firing Its Rockets

QUICKER than you can bat an eye, 24 rockets wham out of the underbelly of the Sabrejet above. They are launched from a honeycomb pod that pops out of the fuselage (right) when the plane closes with an enemy. After firing, the pod retracts automatically to restore the streamlined surface.

A single hit with one of the pod's 2.75-inch Mighty Mouse rockets can destroy the biggest bomber. To help insure a kill, the plane is fitted with more electronic gear than the average television station.

▶▶▶ Woolens can be mothproofed in a washing machine with EQ-53 solution, says the maker, Bonded Chemicals, Lima, Ohio.

Play Pen Corrals Baby on Sand

HERE'S one way to keep the baby from straying and still enjoy a swim at the beach this summer. When rolled up, the Beach Pen can be carried in one hand. Omniproducts Co., 1420 Thomas St., Grand Rapids, Mich., makes it.

Live Cowboys Ride TV Range

THE scene below is not in old Nevada or even Hollywood, but just outside Philadelphia. It's a setting for television's first "live" Western—CBS's "Action in the Afternoon." Other TV horse operas are transmitted from movie films.

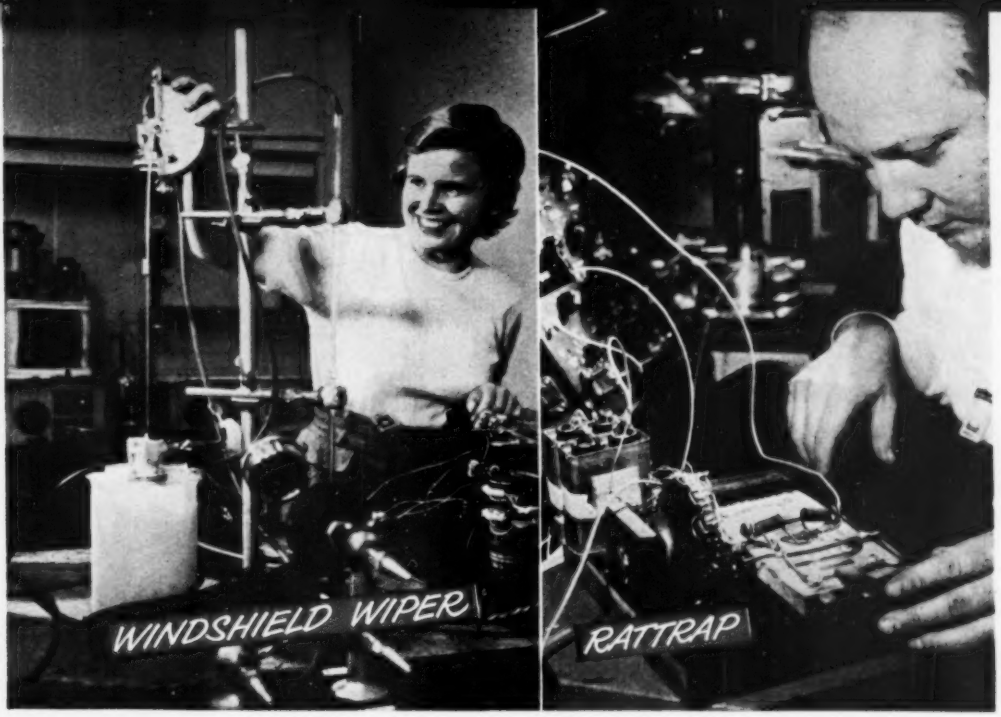
Everyday Gadgets Work for Science

AUTO-SUPPLY dealers may not list a jack as scientific apparatus, but this and many another ordinary gadget often save the day for research workers studying highbrow problems. At right, a jack tests the strength of a heated plastic sample. In the same GE laboratory, a windshield-wiper motor powers a stirring rod to keep a fluid in a freezing bath at an even temperature. The rattrap helps Dr. A. Harry Sharbaugh measure electric pulses. Springing the trap sweeps a carbon brush across a metal contact which, for 1/1,000 second, connects a storage battery with an oscilloscope.

Battery Razor Threatens End to Shave-Free Fishing Trips

DON'T let your wife see this if the thing you like best about camping vacations is the vacation from shaving. It's a shaver that runs on ordinary flashlight batteries. With adapter added, it can be plugged into an automobile lighter socket.

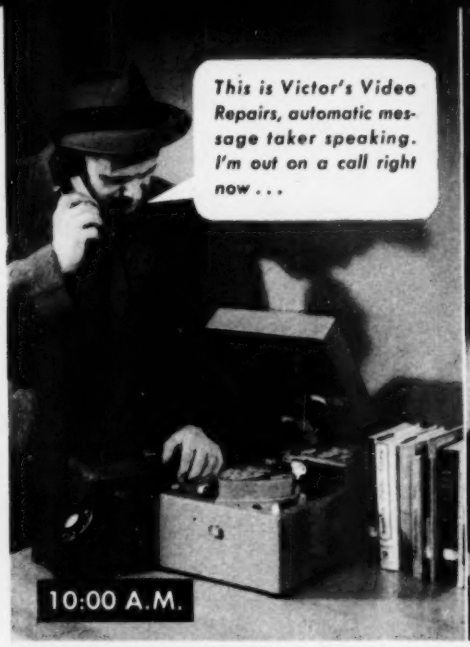
Made in Holland, the shaver has two rotary-action heads with 12 self-sharpening cutters. An unbreakable mirror is attached to the back of the battery case. The North American Philips Co., NYC, distributes the Norelco Sportsman in this country.



Flying Fix-It Shop Makes On-the-Spot Gun-Sight Repairs

THAT's a flying repair shop ready to go up the loading ramp of the transport below. It was airlifted to Korea to do trouble shooting on the intricate radar-controlled gun sights of Thunderjets and Sabrejets.

The fully equipped 26-foot trailer will fly from base to base to "field fix" more than half the gun sights now returned to the U. S. for repair. In an emergency, it can put a bombed-out maintenance depot back in business in two hours—a process that normally takes weeks.



BEFORE LEAVING his one-man shop, Victor talks into his phone, cutting a record on his answering and message-taking machine.

A CUSTOMER dials Victor's number. Her ring starts the robot, and his recorded message is played back over her telephone.

Phone Talks Back, Takes Calls While You're Gone

THE ringing of your telephone need no longer be an empty echo in your office or home when you are not there. Now you can get an attachment that responds to the ring, becoming an electronic secretary that not only answers in your voice but takes messages. It is the Peatrophone, available through the telephone company at a rental of $12.50 a month.

Suppose you are a small businessman, a TV and radio repairman, a plumber or an electrician—or perhaps you have a real-estate office in your home. You are out a lot. You don't employ a secretary. If your phone rings unanswered, a competitor may get the business.

But not with this phonograph-recorder device. Before going out, you place a small four-inch recording blank on the large turntable and lower the recording needle. Then you press a record button and talk into the telephone, dictating an announcement saying when you will be back or where you are. A brief tag line tells your caller to leave a message simply by talking into his telephone.

Next you place this disk on the small turntable and put an eight-inch blank disk on the large turntable, ready to record incoming calls while you're gone.

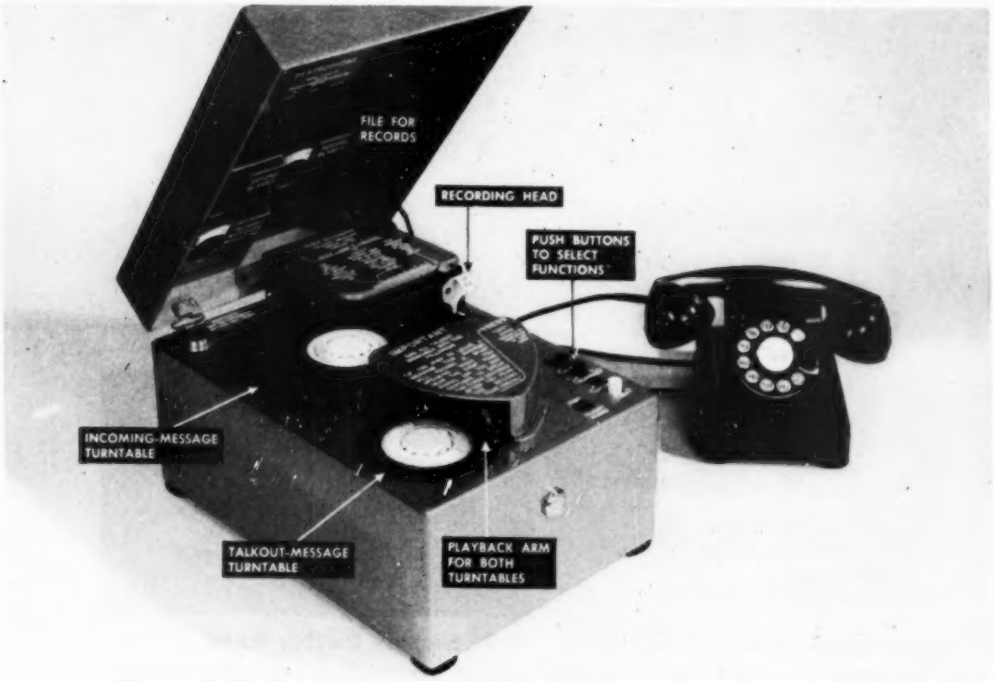
If you want to make sure that your own message is correct, you press a talkout test button and listen in on the phone. Then push the automatic button and go on your way.

When a customer calls in your absence, the ring operates a relay that plays your message into the phone. Then, when your caller talks back, his message is recorded on the large disk. This will record up to 140 incoming messages, each limited to 23 seconds between tone signals, with a three-second grace after the last tone.

When you return, you pick up the phone, press a playback button and listen while the record plays back any messages left while you were away.

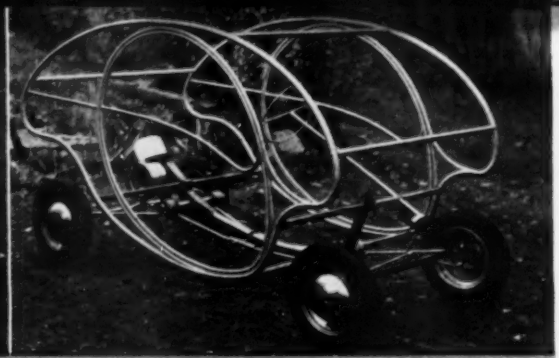
HAVING DELIVERED its phone-answering message, the machine switches to listening and records her message on the large disk.

BACK IN HIS SHOP, Victor picks up his telephone and presses a playback button. The first message he hears is Mrs. Hopkins'.

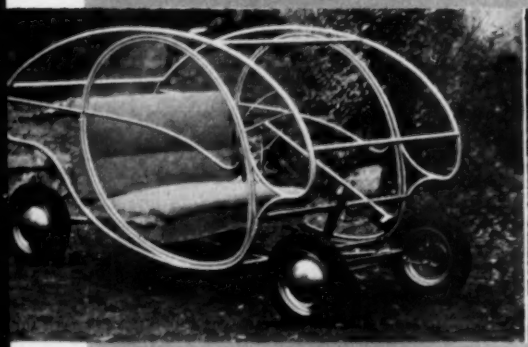


EASY TO OPERATE as a phonograph, claims the maker of the Peatrophone automatic phone-answerer and message-taker. It has a new, four-tube amplifier that will record incoming messages too faint to be heard by the human ear and play them back at normal volume.

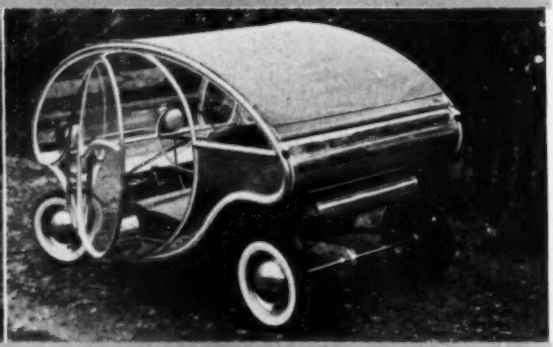
1 Artist Arzens started to build his egg-shaped car by designing a frame like this. Steering gear is like that on a Model T Ford. Wheelbase is 6½ feet, length, seven feet.



2 The body of aluminum tubing next was attached to the steel frame. That engine in rear has displacement of 7.62 cubic inches, delivers five horsepower at 5,300 r.p.m.



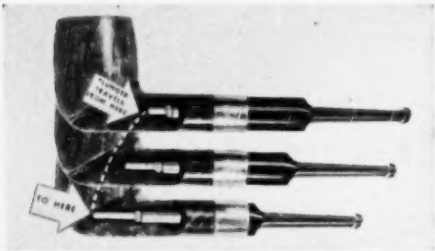
3 Naturally, the vehicle has to have a seat. Here it is. It's 3.1 feet wide—more commodious, the inventor is fond of pointing out, than the rear seat of a famous French auto.



4 This is the Little Town Car, as Arzens calls it, from the rear. The pull-over top is canvas. All the transparent parts are Plexiglas. Empty, the vehicle weighs 198 pounds.

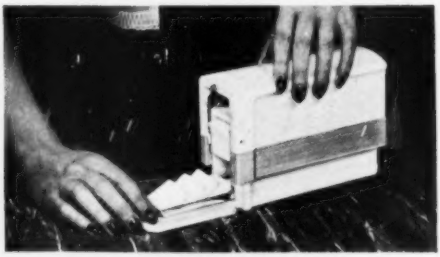
Egg-Shaped Car Is All Windows

PAUL ARZENS, a French artist, decided that to get maximum visibility in a car, it ought to be as open as all outdoors. So he built his own. His belief that "the mechanism



Pipe De-Clogs Without Emptying

HERE's a pipe that you can ram out while smoking it. Pushing the bit forward runs a plunger into the bowl so the Lord Davenport pipe will draw freely again.



Tray Serves Butter Pats

SLIDE the tray from this butter preserver and out come square pats just soft enough for spreading. It's one of the fittings on new Frigidaire refrigerators.

5 ***C'est fini!*** **This egg won't boil—the engine is air-cooled. Do come aboard for a ride, Arzens tells his family. Top speed on the car's one-lung engine is 50 m.p.h. The gearbox has four ratios. This isn't the first version of the Little Town Car. Inventor Arzens hatched himself an electric egg of the same shape 10 years ago, battery-powered.**

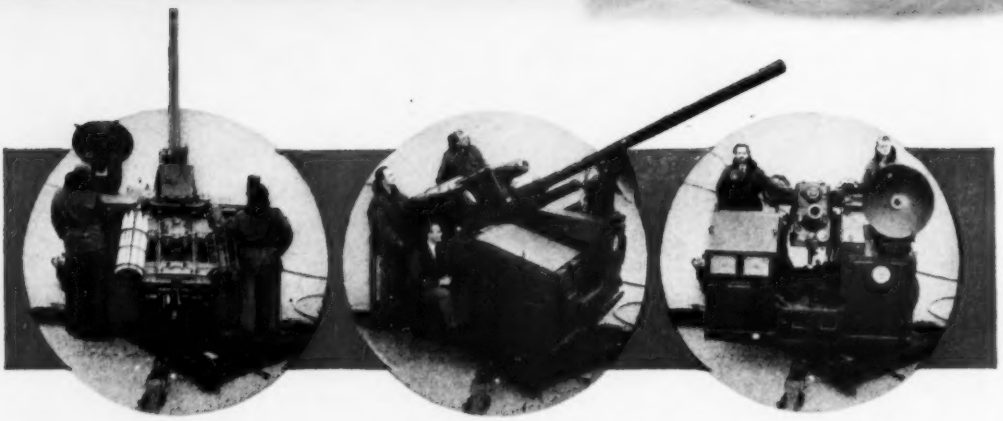
must be a means and not the end" freed him from the limitations of conventional design.

Arzens' car isn't fast, but it's economical. That's because its little Pauvert engine is just about big enough to drive the car—and no more.

Arzens has designed locomotives, too, and is restyling five Paris subway stations.

What the Space Fliers Will Wear This Season

THAT's a pilot at right, not a diver. He's wearing a full-pressure suit that will give safety to Navy stratosphere pilots—or even space travelers. If the pressurized cabin of a plane springs a leak, the suit pressurizes itself and furnishes oxygen so the pilot can finish his mission and get back to base. It has been successfully tested at a pressure-chamber altitude of 70,000 feet. Made of rubber with a Plexiglas helmet, it was developed by Goodrich.



New Guns You Should

Mobility is a must for today's artillery. Postwar models get

IF YOU haven't seen a big gun go off since Cassino or Aachen or Okinawa, it's time you took another look. Postwar models in artillery not only come in new shapes and sizes but, thanks to science, perform tricks that would make a World War II gunner's eyes pop.

In use by the U.S. Army, they will force a major revision in the rules of battle.

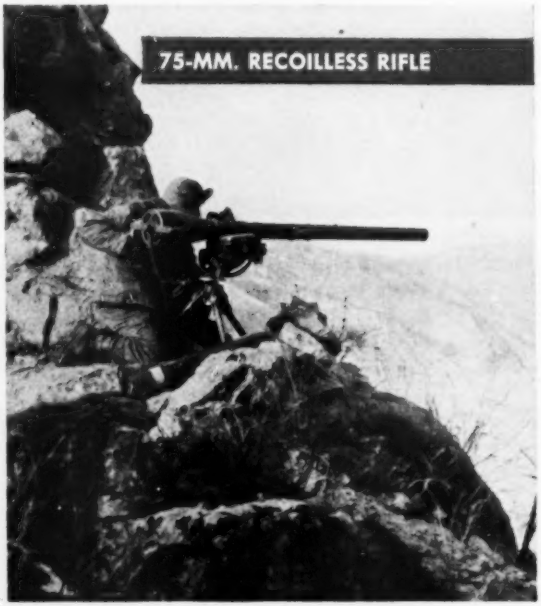
Most spectacular of the new weapons is the atomic cannon—ready, as this issue of POPULAR SCIENCE MONTHLY went to press, for its first test with live atomic ammunition.

But even more ingenious is an anti-aircraft gun just off the secret list. Called the Skysweeper, it's an artillery "machine gun" that can see through clouds or darkness and almost think for itself.

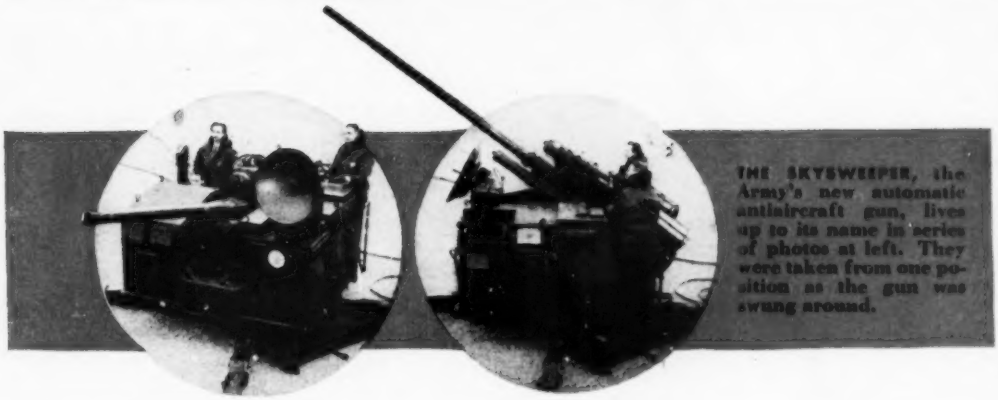
Both guns are brand-new since World War II, and they have one important thing in common—mobility.

These are big guns but they can go about any place an infantryman can go. The 280-mm. atomic gun weighs 85 tons with its fore-and-aft tractors, yet it can speed over highways at 35 miles an hour, navigate rough country, squeeze into a landing ship for amphibious operations. It can go into action in about 15 minutes and give GIs the most devastating close support in the history of warfare.

The 10-ton, 75-mm. Skysweeper, towed by a crawler tractor, cannot quite climb mountains, but it can get through to any



THIS IS THE MOBILITY that puts artillery weapons in the hands of the infantryman.



THE SKYSWEEPER, the Army's new automatic antiaircraft gun, lives up to its name in series of photos at left. They were taken from one position as the gun was swung around.

Know About

By Herbert O. Johansen

their wallop, plus some new tricks, from science, not size.

advanced airstrip that needs protection. It can be carried by air, and within five minutes after being landed can have its radar, electronic computer and fire control in operation to automatically spot, track and fire 45 rounds a minute at enemy planes trying low-altitude sneak attacks at the speed of sound.

Fixed artillery is out or on the way out. Gone forever are guns like the

ATOMIC CANNON

BIG BUT MOBILE, the atomic cannon can get right in behind the infantryman to give him close support. Its devastating charge is easily loaded by means of levers.

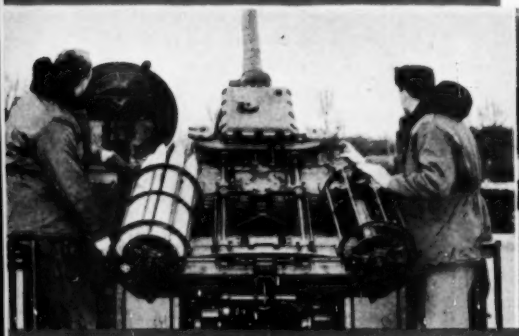
IT AIMS AS IT FIRES. The Skysweeper is the first weapon to have radar, computer and gun all on one carriage. The radar dish is at the extreme right above.

German 76-mile-range monster of World War I that was more frightening than damaging, and the Little David, a 36-inch diameter mortar, developed by the Army in World War II but abandoned. It needed an underground foundation big enough for a small factory—and was about as mobile as one.

Science vs. Science

The Skysweeper, developed by Army Ordnance and the Sperry Gyroscope Co., is an example of how the very science that makes a new offensive weapon can be put to work as a counter-weapon. Attacking planes today rely on high jet speed, radar and other electronic devices to get through and destroy their targets. In the Skysweeper, artillery has met the challenge by loading up with electronics for detection and destruction.

Let us see how a Skysweeper would go into action at a forward area. Our tractor unit hauls us up to a clearing on a hillock. A canvas covering is stripped off the gun and four metal outrigger supports are extended. Then the gun is lowered hy-

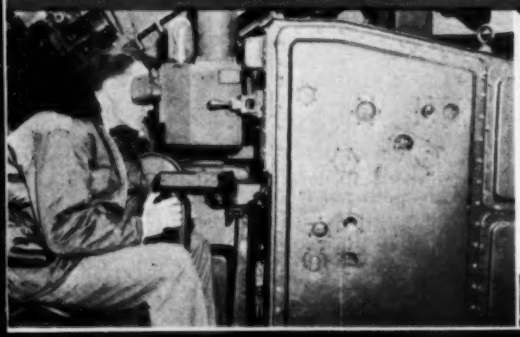


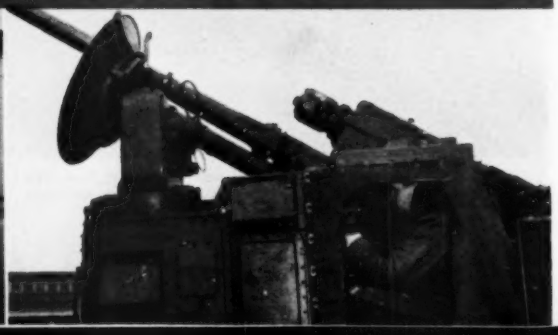
LOADING of 75-mm. ammunition is automatic from twin magazines, as shown above.

SKYSWEEPER travels like this. For firing, wheel carriages are removed, body lowered.

PERISCOPE (below) provides visual tracking of target. Computer dials are at right.

RADAR OPERATOR is key man. Once he locks on a target, electronics does the rest.





draulically to the ground and the wheel carriages removed. The ground is not level, but that will be compensated for automatically.

The radar dish is raised. It is a pitch-black, rainy night, but that won't matter to the electronic eye of our weapon. Into a curtained compartment on the left side goes a battle-jacketed, helmeted radar operator. He presses a button that starts the radar dish on top spinning, sweeping the entire sky. He keeps his eyes glued on one of two cathode-ray picture tubes.

Enemy Plane Approaches

An enemy plane is approaching at 600 miles an hour at a few thousand feet. When it is 15 miles away, the plane appears as a blip on the scope. How the operator knows it is an enemy plane is something we won't talk about, but that is electronic too.

The radar is now locked onto the enemy plane and switched to the tracking scope. As it follows the target, the radar is sending target information to an electronic-brain computer in a compartment on the other side of the gun. This gadget plots range, speed and course of the enemy—and makes up its mind in a split second just where the gun must point so that it will give the exact lead to fire each shell to a point in the sky where the plane will be when the shell gets up there.

105-MM. RECOILLESS RIFLE

WEIGHT OF WEAPON	365 POUNDS
WEIGHT OF PROJECTILE	50 POUNDS
RATE OF FIRE	10 ROUNDS A MINUTE
RANGE	8,500 YARDS

105-MM. HOWITZER

WEIGHT OF WEAPON	5,700 POUNDS
WEIGHT OF PROJECTILE	37 POUNDS
RATE OF FIRE	5 ROUNDS A MINUTE
RANGE	12,000 YARDS

The computer sends this information through servo motors to a hydraulic power unit that can swing the gun around 360 degrees and raise the barrel from straight level to almost straight up.

As the gun swings ahead of the speeding, invisible plane, the radar operator

[*Continued on page 228*]

If Your House Were

Official tests show $40 basement
Even your car offers some

JUST at dawn, one morning recently, you and the house you live in and the car you drive were atom-bombed. It was done by proxy in a nuclear-device test shot at the Nevada Proving Grounds near Las Vegas.

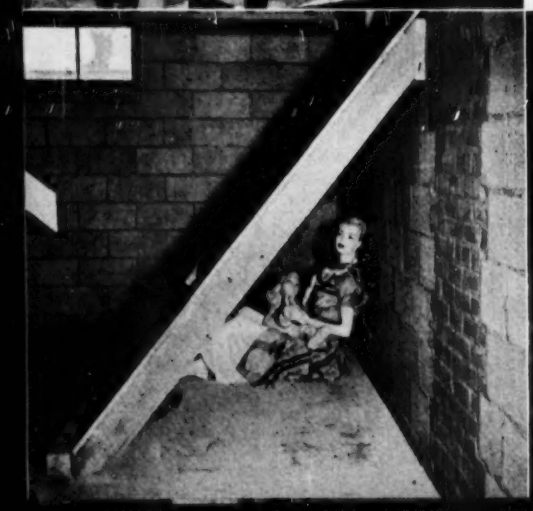
Your home was accurately represented by two neat white frame houses of which a twin could be found in almost any American block. They were colonial houses of standard construction, the kind you'd pay about $20,000 for.

Among the 59 automobiles within two miles of the explosion that morning were cars closely resembling in color, model and make the one in which you might find yourself if an enemy bomb dropped.

Representing you and your family were department-store dummies. Whether a bomb attack found you in bed, at

The Setup

Typical colonial house, with cars parked in yard, awaits blast 7,500 feet away. Another just like it is only 3,500 feet from bomb. Cameras in nearby towers will record how they take it. Store dummies represent family in dining room and basement shelter.



By Darrell Huff and Paul Corey

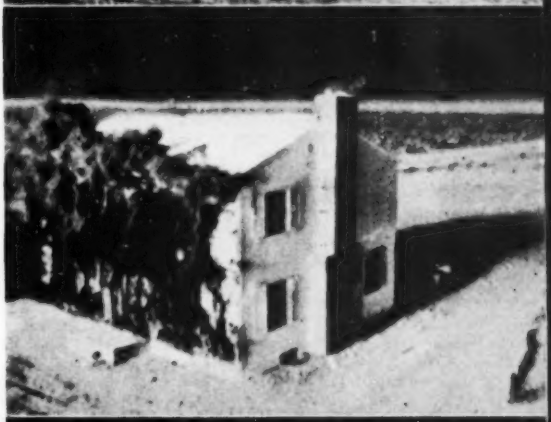
A-Bombed

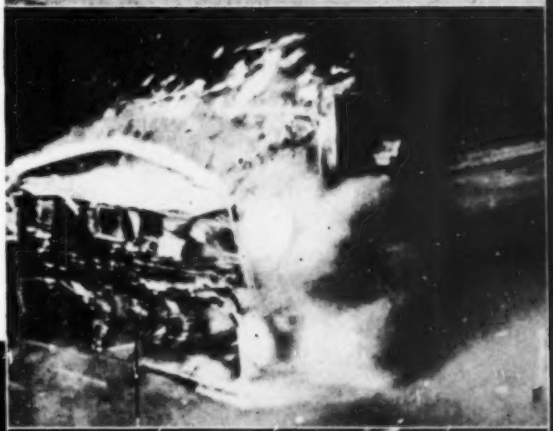
shelter might save you.
protection—if you duck quick.

the dinner table, in your car or protected by a homemade basement bomb shelter, your situation would be accurately represented by one or more dummies.

Beginning as soon as two hours after the great flash illuminated the Nevada desert, official observers began to examine the still-radioactive houses and cars. Their purpose was to learn what you could expect, what rescuers might run into and, above all, what you could do to protect yourself. Other expert inspections continued on the following days.

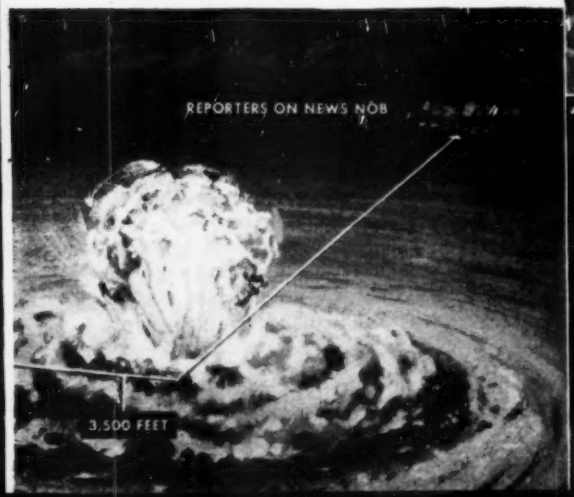
Some of what happened in a few seconds to stand-ins for you, your home and your car will not be clear for months. Other things became apparent quickly. It was to put these facts to work at once that some 600 civil-defense authorities,

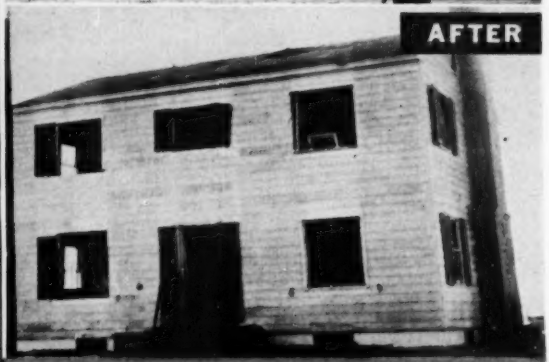




What Happened

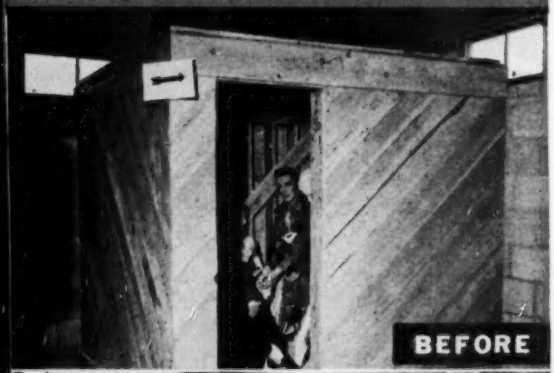
High-speed movies show nearest house disintegrating in two and a third seconds: Bomb flash lights scene, house bursts into flames, blast wave blows out fire almost immediately, structure is ripped into kindling. But dummies in basement shelters were unharmed.





FARTHEST HOUSE, about 1½ miles from blast, was damaged structurally but stood up. Windows were splintered, stairway was twisted, plaster knocked off, furniture tossed around.

IN BASEMENT, joists cracked but dummies in both corner shelter (below) and lean-to were unharmed. Damage to ones upstairs showed people there would have been hurt or killed.



newspapermen, photographers and radio and television people were present.

We were there as representatives of POPULAR SCIENCE MONTHLY to report the facts that would be most useful to you in protecting yourself and your family in a real attack.

What would happen to you under bombing would depend in part, of course, on things you can't do anything about: how big the bomb was, how far away, how high the burst, the weather conditions.

But there *are* things you can do to cut your risk way down.

One of the test structures, House 1, was 3,500 feet—about two-thirds of a mile—from the explosion. The bomb had a force estimated at 15 kilotons, the equivalent of 15,000 tons of high explosive, and it was set off on a tower at a height of 300 feet.

If House 1 had been your home and you had been anywhere in it above ground level, you could hardly have survived.

This is what happened: When the concussion struck the front of the house the force went right on through, blowing out both ends, including a fireplace chimney. The back wall went over and crushed a car standing behind it. The front wall and floor, or pieces of them, were shoved over and dumped into the basement where a simple bomb shelter of a homemade type took their weight and held it.

Bomb Shelter Means Survival

The dummies on the first and second floors were destroyed, as you would have been. Those in the basement shelters were not even moved, and radiation level there was one-tenth that above ground.

Anyone sitting upright in the car in the yard would probably have been killed.

The conclusion is clear: in an area struck as this one was, the only place you could expect to survive would be in a bomb shelter.

Your chances would be much better if your house received the much lighter blow suffered by the second test house. House 2 was 7,500 feet from the point

directly under the explosion. That point is called Ground Zero.

You could expect to be tossed roughly about, probably injured, possibly killed —if you were above ground level.

If you were in the basement you might come through nicely, although the floor joists might crack and threaten to dump debris upon you. If you were in a basement shelter, this would be eliminated.

The damage to your house would be sufficient to make it unfit to live in even after radiation died down, but $1,500 to $2,000 worth of repairs would make it livable again.

All this assumes that your house would follow the pattern of what happened to Test House 2. When observers came in—very briefly—only two hours after the blast, they found somewhat freakish conditions. Some dummies were in pieces; a woman sitting at the dining table had been half blown away but her fingers still held a cigarette. "Little Johnny," representing a boy sitting on the arm of the living-room couch, was on the floor but undamaged.

Is Your Car a Foxhole?

The test bomb threw a good deal of light also on a much-debated question: Is your car a sort of rolling foxhole? The answer now appears to be that it's not a very good one but it is better than nothing.

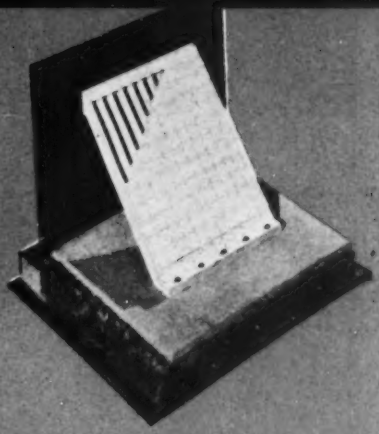
The first observer back from the radioactive area was able to say quite simply what he would do if the best protection he could find at bomb warning was a car.

"I'd roll the windows open and duck down on the seat or floor," he said.

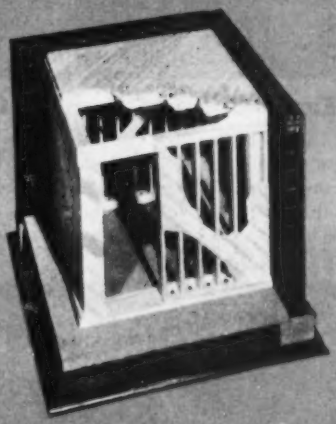
Later examination of the guinea-pig cars showed why. Otherwise undamaged automobiles, some of them two miles from the burst, had their steel tops crushed as if struck by a giant fist.

But cars in the same area that had been left with windows open showed no damage. Open windows apparently had permitted pressure to equalize. Cars in this fairly distant area seemed to be in running order.

[*Continued on page 272*]



LEAN-TO SHELTER, shown on opening page, costs less than $40. To build it, nail two-by-tens to cinder-block basement wall six feet from floor. Bolt four-by-four to concrete floor six feet from wall. (Star drill makes holes for expansion bolts.) Between header and floor butt, nail two-by-sixes on five-inch centers. Over them nail one-by-six matched lumber.

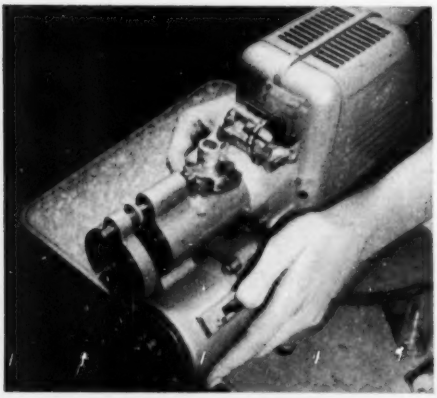


CORNER SHELTER, shown on opposite page, costs about $100. Outside measurements are seven by seven feet. The two-by-six studs are placed on eight-inch centers. They are fastened to two-by-ten mudsills and capped with a double plate upon which the two-by-six joists are set. Sides and top are covered with matched boards placed diagonally for additional strength.

BASHED-IN TOP was only damage to this Ford, two miles from bomb. Of those closer to blast, light-colored cars fared better than black cars. Only one, a mile away, caught fire.

Earth-Bound Chamber Checks Out Equipment for Space Flight

THIS boiler-like contraption is a giant pressure cooker in reverse. It duplicates conditions likely to be met by electronic equipment at extremely high altitudes. When the door is hermetically sealed, vacuum pumps can decrease pressure till air inside is 1,000 times rarer than at sea level—so thinned down that water boils but can't get hot! The chamber is in use at the Signal Corps Center, Fort Monmouth, N. J.



Projector Teaches Reading

THE trick slide-film projector above helps teach youngsters how to read by giving them a brief, sharply focused glimpse of a word on a screen. A motor-driven cam (center) moves the lens to throw the image in and out of focus in a split second. Stanford E. Taylor, Educational Developmental Laboratories, New York City, invented it.

Why Search for Your Glasses?

A PLASTIC spec box that attaches almost anywhere with screws, suction cups or adhesive gives the fellow who always mislays his glasses a break. SPX-Nest Products, 6458 S. Halsted St., Chicago, makes it.

Sharpener Catches Shavings

PUT a new point on a pencil with the sharpener at left and all the shavings are neatly gathered in the barrel bottom. The cutting blade is set in a screw-off lid. Wilco Enterprises, 2123 Pine St., St. Louis 7, is the maker.

"Fifth wheel" and stop watch showed acceleration from zero to 60 m.p.h. in 20-plus seconds.

WILBUR SHAW REPORTS FROM THE DRIVER'S SEAT:

Plymouth's New Transmission Puts Clutch on Part-Time Job

ON THE only real hill I know in flat Indianapolis—and don't laugh; this baby has *grades*—I got a special thrill the other afternoon. I found out what a remarkable climber the '53 Plymouth is with the new Hy-Drive transmission.

I started from a standstill and began to head up the slope with no more pressure on the accelerator than I'd give it in city traffic. The hill steepened rapidly, but the Plymouth didn't seem to notice that. At an angle when most cars would begin to cough and labor, it was still moving as strongly and calmly as a long-distance runner at the start of a race. I really don't think I would have needed to give it a bit more gas to get to the top, but I did step a little harder on the pedal halfway up—force of habit, I suppose. Instantly the car picked up speed as if on level ground.

In addition, Plymouth's Hy-Drive is an outstandingly smooth performer in city traffic. There's enough slip at idle to stop at a signal light, leaving the car in high. It doesn't provide jack-rabbit starts, which are a little silly anyway, but it accelerates and decelerates quietly and effortlessly.

Acceleration Should Satisfy Anybody

And as for the open road—well, out on the Indianapolis Speedway I found that in Hy-Drive the Plymouth would accelerate from a standing start to 60 miles an hour in 20 3/5 seconds. That's enough oomph to suit anybody but a hot-rodder, and Plymouth isn't building cars for that fraternity. The fellow who wants to get away from the crowd faster can use the standard shift, which is there anyway. Using it myself, I

CONVENTIONAL SHIFT LEVER has only "neutral" marked: engine won't start if car is in gear. In use, it is normally kept in high. R.p.m. indicator was put on to measure stall speed.

got the Plymouth up to 60 from zero in 16 seconds.

Plymouth, last of the Big Three to forsake manual shifting, hasn't forsaken it entirely. There's still a conventional gearshift lever on the steering post and a clutch pedal on the floor. Most of the time, however, you have no use for them. By just letting up on the gas, you can stop for a light without shifting out of high.

The Hy-Drive transmission, now available at Detroit for an extra $135 plus tax, is automatic with one exception. You have to shift it from neutral to high to begin with. From there on, it's on its own—in high gear. That's how it got its name.

Most Efficient Torque Converter

The Hy-Drive assembly consists of a modified standard three-speed gearbox and clutch behind a torque converter. Plymouth's torque converter has been in the process of development for three years, and it's the most efficient in the industry.

At stall, or the instant before the car starts to move, that converter, only 11¾ inches in diameter, multiplies the engine's torque 2.6 times. In the same situation, Ford and Chevrolet converters multiply engine torque 2.1 times.

The course of power through Plymouth's torque converter is conventional, from engine-driven impeller to turbine and on through the turbine shaft and clutch to the transmission. The converter, unlike Ford's and Chevrolet's, has two stators instead of one to redirect the flow of oil coming off the turbine blades so that it gives a boost to the impeller. Two stators, Plymouth engineers say, do a better job.

The clutch, once you have shifted to high, serves no further purpose unless you get stuck in sand or want the engine to help brake your speed down a long grade or unless you want to back up. At any of these times, you can shift gears manually.

The torque converter functions whenever the engine is running, whether or not you are using Hy-Drive. For instance, if you need to shift into low gear for emergency work, the torque converter provides its initial 2.6:1 boost to the low-gear ratio of 2.37:1. Add to this the

fact that the 1953 Plymouth has a 3.73:1 rear axle. There's a total gear reduction at stall of nearly 23:1—just about enough to haul the Queen Mary off a mudbank.

Transmission Has Safety Feature

You can't start a Plymouth engine with Hy-Drive unless the shift lever is in the neutral position. This is a most important safety factor. No one can say so with more feeling than I, for a good friend of mine lost both legs because his car's automatic transmission didn't have this feature. He happened to be standing in front of his car when someone else started it. The car was in gear, and it pinned him against a workbench, crushing his legs.

Once the Hy-Drive Plymouth has been started and shifted into high gear, the flow of power from the torque converter affects that gear alone. There is no up-shifting or down-shifting, as in Ford and Chevrolet automatic transmissions.

Torque Highest at Start

The amount of torque that the Plymouth converter adds to the engine's own supply is highest just as the car starts to move. Thus it provides an initial acceleration effect like that of normal low gear. As the car picks up speed, however, the torque converter provides less and less extra torque, until at 40 miles an hour, it adds none. From that point on, it is merely a fluid coupling, transmitting the engine's power through the high gear to the rear axle without influencing it at all.

As the car slows down, on the other hand, the torque converter's influence is felt again and it grows as the car speed drops. This prevents "engine lugging," which you would feel if you slowed too much in conventional high gear. This rise in torque at low speeds is also what makes the Hy-Drive transmission such a dandy hill climber.

Another advantage of the torque converter is its low stall speed, only 1,300 revolutions per minute. That means that there isn't any noisy engine surge before the car starts moving. This low stall speed plus its high conversion ratio, the Plymouth people boast, result in less waste of gas than with other automatic drives.

Plymouth's torque converter, like all converters made by Chrysler Corporation, works on engine oil. This calls for a much larger supply of oil than previous models have needed—11 quarts instead of five. But Plymouth engineers say you don't have to change it but twice a year—spring and fall. Instead, they say, replace the filter every 5,000 miles. END

ON INDIANAPOLIS SPEEDWAY, which will be front-page news again May 30, I put "fifth wheel" on a '53 Plymouth equipped with Hy-Drive for precise accuracy in acceleration tests.

SPEEDOMETER ERROR, common to all cars, I found was five miles an hour in the Plymouth at 60. The instrument in my right hand connects to "fifth wheel" for an exact reading.

Longer Jeep Is Front-Line Ambulance

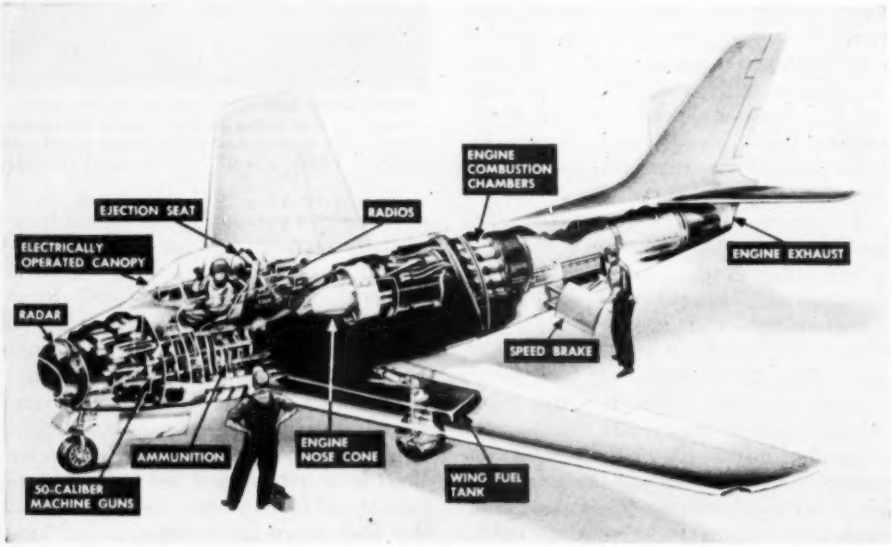
THIS cross-country Jeep ambulance can evacuate wounded from rough terrain. The extra-long heated body on a 100-inch wheelbase can carry three litter patients, or two litter and four ambulatory patients, plus a medical corpsman to attend wounded en route.

New-Style Tub Fits Small Space

A CROSS between a stall-shower receptor and a regular bathtub, the new fixture at left fits in a space only 38 by 39 inches. Its low height makes children's baths easier, while the diagonal bathing area provides ample room for adults. American-Standard makes the Restal.

Inside the Sabre: Cutaway Shows Where It Packs Its Punch

WHY Sabrejets chalk up eight MIG kills for every single loss they take is shown in the cutaway drawing below. Two classes of the North American plane are now fighting—the E and the F. Both carry electronic fire-control gear that computes range, speed and probable course of the enemy before lashing out with Mighty Mouse rockets.



Commando Tactics Challenge Everest

British colonel leads an elaborately equipped, precisely planned assault on world's highest, toughest mountain.

"JUST you wait, old thing, we will get you yet."

Capt. Geoffrey Bruce, of the British Army's 6th Gurkha Rifles, shook his fist at the peak of Mount Everest, about 2,000 feet above him.

Bruce was standing at the highest point on any mountain any man had reached: 27,235 feet. There the icy 100-mile-an-hour wind had so exhausted him that he could climb no higher.

This was in 1922. Everest—the world's tallest mountain—is still waiting.

Other mountains, like Annapurna, have felt the conqueror's boot. But of 10 expeditions to Everest since Bruce's, only one went significantly higher. Raymond Lambert, a Swiss, and Sen Tensing, a native porter, got 975 feet higher just a year ago, in May, 1952.

Now a new team of British mountain climbers is set to drive for the summit.

Its 10 climbers—plus a doctor, a psy-

OXYGEN SUPPLY (above) and climbing tactics (top picture) are tried out in mountainous North Wales by members of new British expedition before attempt on Mt. Everest.

chologist and a cameraman—are led by another soldier, Colonel John Hunt, an ex-Commando leader on leave from the British Army of the Rhine. And, as might be expected, he has organized his attack on Everest like a military campaign:

- He has worked out a mechanized supply line that involves hauling a sledge up the mountain by winch.
- He is using communications more than any previous expedition—radio both for intercommunication between camps and to keep informed about the progress of the monsoon from the plains of India.
- He plans to send his climbers on the last hike toward the peak in assault waves—teams of two or three each—and to send out as many waves as he must to capture his objective.
- And, perhaps to the horror of old Everesters, who like to have their favorite sardines or peppermint drops available at all times, Hunt is feeding his men on army field rations.

UNCONQUERED EVEREST towers over base camp of previous expedition pitched on a rock-strewn glacier.

Unpredictable weather caused many former Everesters to have only the most flexible schedules, but Hunt—in Commando fashion—drew up a timetable that showed where he wanted to be at all times. He planned to set up a supply depot in Nepal, the oriental kingdom where Everest is located, in March; to have a base camp established in April; to be on Everest by mid-May.

Hopes to Beat Last Year's Record

He planned to be in position high on the mountain three weeks earlier than the record-setting Swiss were a year ago. And he planned to send his assault teams toward the summit before the spring monsoon, usually mid-June, brings powder snow that wipes out the foot- and handholds on the way to the summit.

Hunt's clothing and equipment—which also reflect his Commando background—might well cause the old Everest hands to turn green with envy.

Used to Wear Knickerbockers

Some of them, in the days of Captain Bruce, went out in knickerbockers and turtleneck sweaters. To put it mildly, these were not adequate against the minus-65-degree cold and up-to-150-mile-an-hour winds near the peak.

Hunt's climbers have cotton windproof suits, double-lined with nylon. The smock of each suit has a hood and visor for protection against wind and snow. An inner, two-piece suit of down is worn under the windproof outer clothing. In case a climber gets cold, he can also put on two featherweight wool jerseys and a heavy wool pull-over. Still, this year's Everester wears a total of only 3¾ pounds of clothing—a blessing at the high altitudes where every ounce is a burden. Each climber's suit is of a different color from anyone else's, to provide instant identification at long distances.

Under fur and wool mitts they wear skintight silk gloves that are never, never removed. These, Hunt hopes, will avoid the tragic frostbite suffered by the French climbers who conquered the giant Annapurna.

Old-time Everesters filled pages of the Royal Geographical Society's dignified official literature with their gripes about tents, sleeping conditions—and tea. Their tents blew to pieces. Or they were too cold. Or there was no ventilation. Or two men in a tent got lonesome.

Fur-lined boots for Everest expedition are made of leather treated so it won't freeze stiff.

Hunt's two-man tents can be joined at each end to make a whole tunnel of them. Thus many men can stay together and bat the breeze as much as they like. These two-man jobs are of cotton nylon, tough, wind-resistant. They have rubber-proofed ground sheets. With all these features, each of them weighs only 12 pounds.

Hunt has also provided miniature six-pound tents for the highest places, and de luxe, dome-shaped, 12-man tents for convivial quarters lower down.

Stones Are Sharpest at Bedtime

The basic complaint about sleeping conditions, from former expeditions, was that the sharpest stones in the world are to be found on Everest—right between your shoulder blades, just after bedtime. Colonel Hunt's men sleep on two layers of air-filled mattresses.

And they carry new butane stoves that will boil snow water for tea in a fraction of the time—often hours, at high altitude—that earlier British climbers complained about.

Colonel Hunt's other special equipment includes:

- An avalanche gun to knock down snow ahead of the party before (it is hoped) the snow starts to avalanche.
- A long, light sectional ladder to bridge crevasses. The climbers don't have to swing hand-to-hand on ropes over these thousand-foot-deep chasms.
- Oxygen equipment specially designed to give a man a four-hour supply for that last trek to the top.

On the record, the odds are 100 percent against Colonel Hunt. But if precision equipment and Commando tactics can reduce such odds, his chances of conquering Everest are the best since men began trying more than 30 years ago.—*Gardner Soule.*

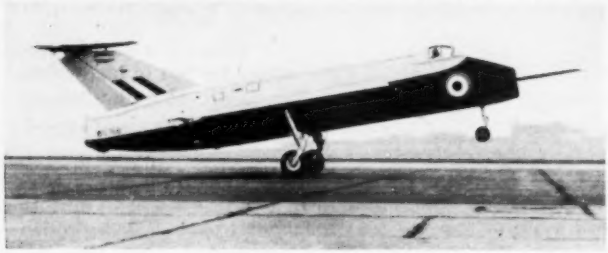
Twin Copter Set for Passengers

THE first tandem-rotor helicopter to be licensed for commercial use, the 90-mile-an-hour MC-4 may be ferrying civilian passengers by the end of the year.

Its three-blade rotors, 23 feet in diameter, overlap as the 200-horsepower engine spins them in opposite directions. The tandem design makes loading faster and easier because cargo placement is less critical, according to the builder, McCulloch Motors Corp., Los Angeles.

▶▶▶ More people now fly across the Atlantic than go by ship.

New British Research Plane Equipped with Adjustable Wings



THIS new British jet plane, resembling a praying mantis, is the experimental SB5. It has wings that can be adjusted for varying degrees of sweep back. Short Brothers and Harland, the designers, hope it will turn up new data on high-speed flight.

Faster Turboprop Transport to Be Made for Air Force

NEWEST turboprop transport, the C-130 will fly assault and support missions for the Air Force at speeds and altitudes greater than any current military transport. The Lockheed design has a wingspan of 132 feet, length of 95 feet and height of 38 feet. Loading is through a truck ramp in the tail.

Plastic Henry J

Makes Play for Sports-Car Fans

Kaiser-Frazer's new "show-off," with the European look, weighs 1,500 pounds less than the lightest steel-body U. S. convertible.

MANY an eye will blink in wonder and admiration when Kaiser-Frazer's dazzling bid for the sports-car market appears on the nation's highways in July.

Howard Darrin, its noted designer, believes the American public longs for "show-off" cars. The KF-161 is a show-off in practically every respect, from plastic body to beefed-up engine.

It is as low as a racing car—36 inches from ground to cowl, only 54 inches to the crown of its fold-away top—and nearly as fast. Its top speed is over 100 miles an hour, the exact figure depending on who is driving. It takes off like a rocket, whisking from 10 to 70

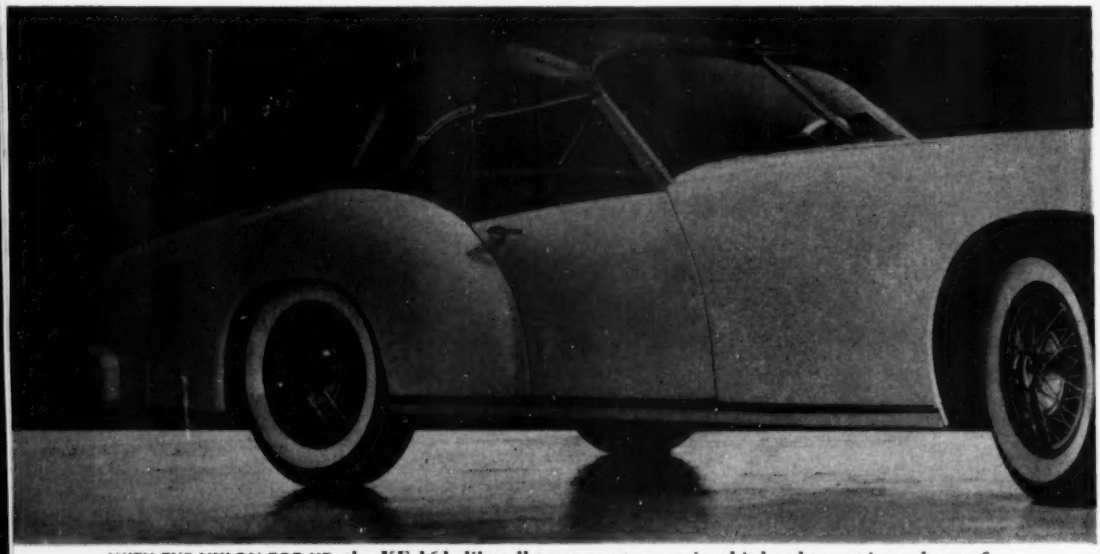
TOP-GRADE LEATHER covers seats and floor tunnel, lines doors and dash. All instruments are familiar to a stock-car driver except the tachometer, at the left of the ignition key.

miles an hour in high gear in 15 seconds.

Its power plant is a six-cylinder Henry J engine souped up, with high-compression head, three carburetors in line, a modified camshaft and dual exhausts, to provide better than 100 horsepower. The "161" in its name is for piston displacement. Compression ratio is 8:1.

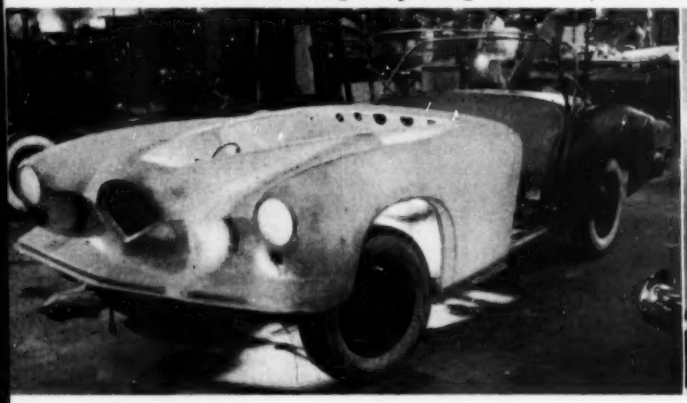
The KF-161's speed and swift getaway are partly the result of increased power, partly of reduced weight.

It is the first car with a body of glass-fiber-reinforced plastic to be produced in quantity. Its body weighs only 300 pounds, enabling the completed car to tip the scales at a fraction over a ton, or about 1,500 pounds less than the lightest steel-body U.S. convertible. The weight-to-power ratio is 22 pounds.



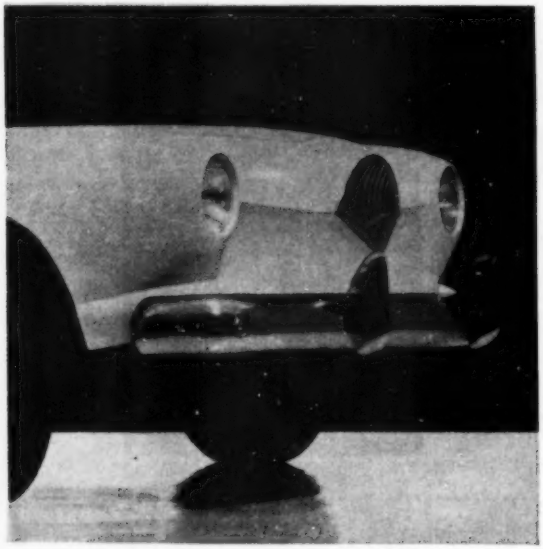
WITH THE NYLON TOP UP, the KF-161, like all true sports cars, is a bit hard to get in and out of.

LIGHT SHOWS THROUGH the glass-fiber-reinforced plastic body in its unpainted state, when it resembles animal horn. The darker-hued rear end has been given priming coat.



IT'S A TEMPTATION to play with the sliding doors of a KF-161. Each travels on a metal rail that is part of the car's frame. As you can see, the driver sits mighty close to the ground.

The car's body is molded in seven parts: front end, rear end, hood, rear-deck lid, doors and floor. The parts that fasten to the frame are bolted to it. The parts that, like the hood, fasten to other plastic parts, are hinged. Sections where bolts pass through the plastic shell are built up to provide extra strength. The hood, by the way, opens along its right-hand side.



Front flap snaps onto windshield.

Darrin believes that since the number of foreign sports cars registered in the U.S. has doubled in the last three years, there's a lively potential demand for an American car of the same general heft, size, look and speed.

His KF-161, which is 15.3 feet long, is exceedingly graceful and has a minimum of "gook." That is the word which true sports-car fans use to describe all hydraulically operated gadgets, chromium decorations, power steering, automatic transmissions and riding comfort.

Has Typical Hard Sports-Car Ride

The KF-161's ride is hard, as the lover of sports cars thinks it should be. The steering and shifting are standard. There's almost no chrome work. The doors—a brand-new note—slide into the front fender cavities instead of opening out, but you have to slide them yourself. Even the wire wheels, which add so much swank to the car's appearance, are optional.

Because of its exceptionally low center of gravity, the car corners beautifully and clings to the road. It has 132 square inches of braking surface to restrain an eager foot at the accelerator.

The price—not yet firmly decided—is rumored to be under $3,000.—*Wesley S. Griswold.*

THE NOVEL REAR-DECK LID swings open in a backward direction, with its widest opening near the seat backs. The collapsed top, as well as luggage, is lowered into the rear end there. To put the top up, you first have to raise the rear-deck lid, which covers it completely when closed. The top opens fanwise as it is hoisted out of the rear end.

To see how you patch a plastic fender, please turn the page.

When a Plastic Fender Meets a Tree

1 THERE'S NO DENT as a result of the encounter with the tree. Wood chips ground into the car's body make the scar, which is about 14 inches long, look a lot deeper than it is.

2 FULL REPAIR TOOK AN HOUR and began with buffing and cutting through the crack with a grinder so that a firm patch could be made. Note how fender's shape returned.

3 MAKING THE PATCH consisted of laying a strip of glass fibers along the crack and coating the whole area around the scar with a brush dipped in polyester plastic.

4 CURING WAS SPEEDED with a battery of infrared lamps set up close to the car. The patch was then buffed again and the area painted until it matched the rest of the fender.

They Say Now.....

"As we learn to mine the sea, we are not going to be shy of essential minerals."—CHARLES F. KETTERING, VICE-PRESIDENT, GENERAL MOTORS.

"Jet transports will be capable of linking New York and Los Angeles in four hours."—LIEUT. GEN. JAMES H. DOOLITTLE.

"It is the freedom to disagree, to quarrel with authority on intellectual matters, to think otherwise, that has made this nation what it is today."—DR. JAMES B. CONANT, THEN PRESIDENT OF HARVARD UNIVERSITY.

"If scientists discover how to split atoms in the oil molecules, a pint of gasoline may yet propel a plane around the world."—E. W. ENDTER, PRESIDENT, CALIFORNIA OIL CO.

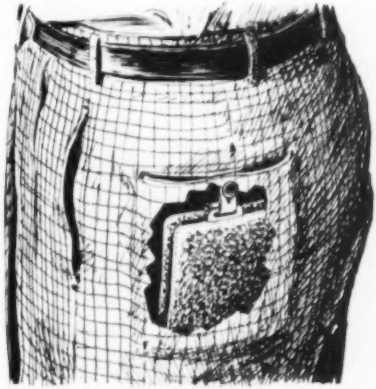
"It is the simplest questions which are the hardest to answer."—EDGAR ANDERSON, ST. LOUIS UNIVERSITY BOTANIST.

"Using available materials and current engineering practices, it is possible to design a multi-step rocket that will accomplish a flight to the moon in perhaps three or four days."—KENNETH H. JACOBS, ARMOUR RESEARCH FOUNDATION.

New Ideas
FROM THE INVENTORS

1 Atomic Energy to Signal Trains. The clicking of Geiger counters would operate track signals on this atomic-age railroad. Radioactive materials and suitable detectors would flash control signals between trains and track sections. Since radioactive material needs no external energy and is immune to power failure, the system would be particularly useful for track-to-train signals on remote branch lines.

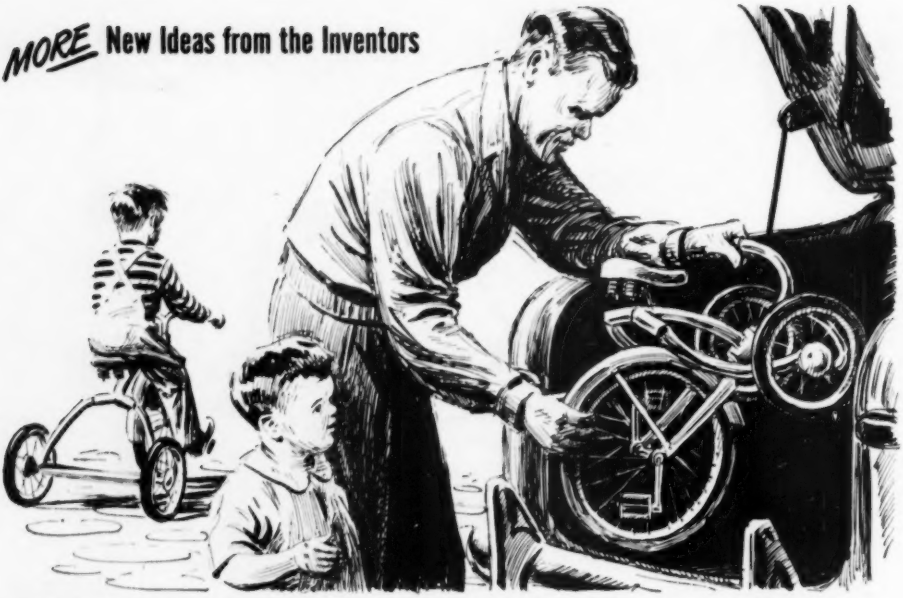
2 Iron Plate to Scrape Paint. This attachment would turn your wife's iron into an efficient paint scraper. Clipped to the sole of any standard iron, it would apply the iron's paint-softening heat over a relatively large area. Loosened paint would then be removed by a scraper plate riveted to the bottom of the attachment.



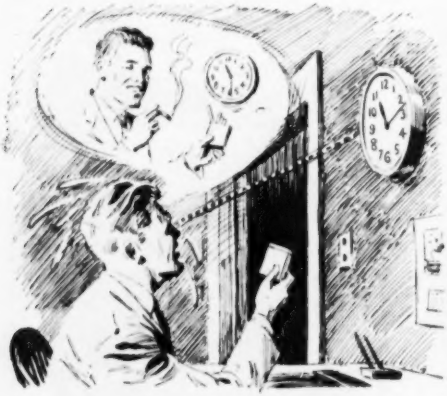
3 Wallet Tab to Foil Thieves. Pickpockets will have to find other work if wallets like this come into fashion. A leather tab buttoned to your pocket would make the billfold practically theftproof. Drawn through a slot on the opposite side, the tab would also help fold the wallet more compactly, keep it from bulging.

Please turn the page for more new ideas.

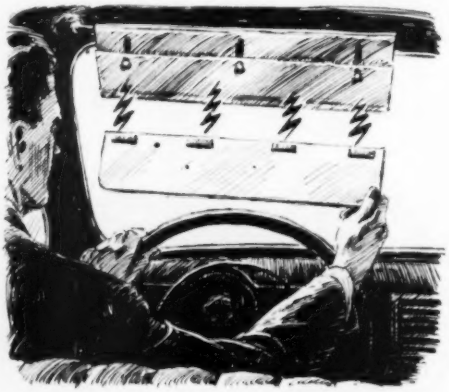
MORE New Ideas from the Inventors



4 Tricycle to Fold Up. Those joy wagons for the younger set could be carried and stored more easily if they folded into compact metal pretzels like this. In assembled position the frame members would be held together by tight-fitting sleeves. Springs and keyed slots would lock the frames in the sleeves but permit you to disengage the parts when you wanted to fold the tricycle into minimum space.

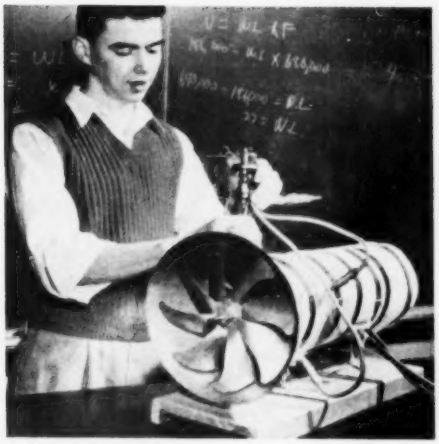


5 Timed Case to Limit Smoking. Smokers who have the will but not the will power to cut down could get help from this cigarette case. A built-in timer would keep the case locked for a fixed interval. Opening the case would automatically reset the timer for another full interval.



6 Magnetic Visor to Cut Glare. Road glare couldn't sneak around an adjustable visor like this. Four magnets along one edge of a transparent plastic glare shield would hold it to a metal sleeve which slipped over the regular visor. The shield could be shifted to block out light.

U.S. patents on these inventions have been granted to: 1. Ernst Vogt, Wallisellen, and Walter Heilpern, Zurich, Switzerland; 2. August F. W. Helmhold, Ft. Thomas, Ky.; 3. Sam Rothschild, New York City; 4. Samuel R. Carson, Columbus, Ohio; 5. Garrett H. Harris, Jackson, Miss.; 6. David O. Jones, Pasadena, Calif.



Stovepipe Makes Model Jet

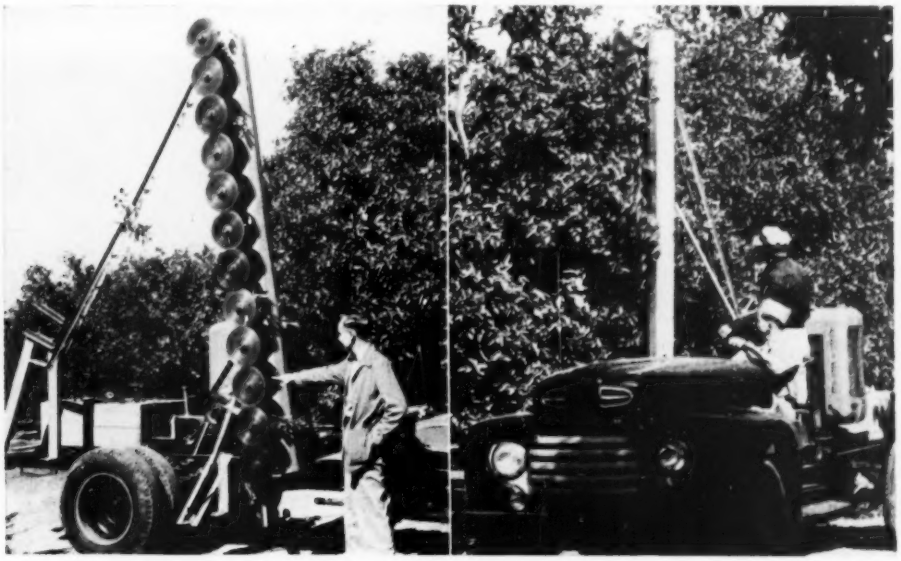
STOVEPIPE provided the biggest piece of material for a model turbojet engine built by Harry Cassidy Jr. of Painted Post, N. Y. Inside the asbestos-wrapped casing are four ceramic combustion chambers and a two-stage turbine of stainless steel.

Tank Gives Warm and Hot Water

THIS heater has two separate pipelines to provide hot water for different needs. Water of 180° runs to washer and dishwasher while water at a non-scalding 125° flows to bathroom and kitchen taps. It's the Ruud Duo-Temp Laundrymaster.

Saw Blades on Truck Boom Trim Hedges Fast

THE giant hedge clipper below makes an easy job of trimming citrus-tree branches. A dozen 12-inch saw blades are mounted in a channel-iron boom that can be raised and lowered hydraulically. The saws, powered by a 25-hp. engine, rotate in the same direction and are staggered and overlapped to cut limbs cleanly. D. S. Prosser of the Florida Citrus Experiment Station devised the pruner.



"Last Night

Experts tell what you can do to make your car harder to steal and easier to recover.

By Liam O'Connor
PSM PHOTOS BY HUBERT LUCKETT

A CAR was stolen from a friend of mine a year ago. The thief removed the hinges of the garage doors. He found the key in the ignition lock, a tank full of gas and a rear compartment packed with fishing tackle. On the workbench, the thief left a note: "Thanks for everything."

My friend called the police. The car was a 1951 Buick, he told the officer, a Roadmaster convertible, dark gray.

What was the license number? He couldn't remember. The registration and title papers were in the glove compartment. Did he have the engine number? No. How about the serial number on the chassis? He'd never even noticed it. Well, the tire numbers then? No, sorry.

"I'm sorry, too," the officer said. "By the time we dig up your license number, the car may be several states away with a new set of plates. Did your car have any distinguishing marks—any body scratches or distinctive repair work?"

No, the car was almost new.

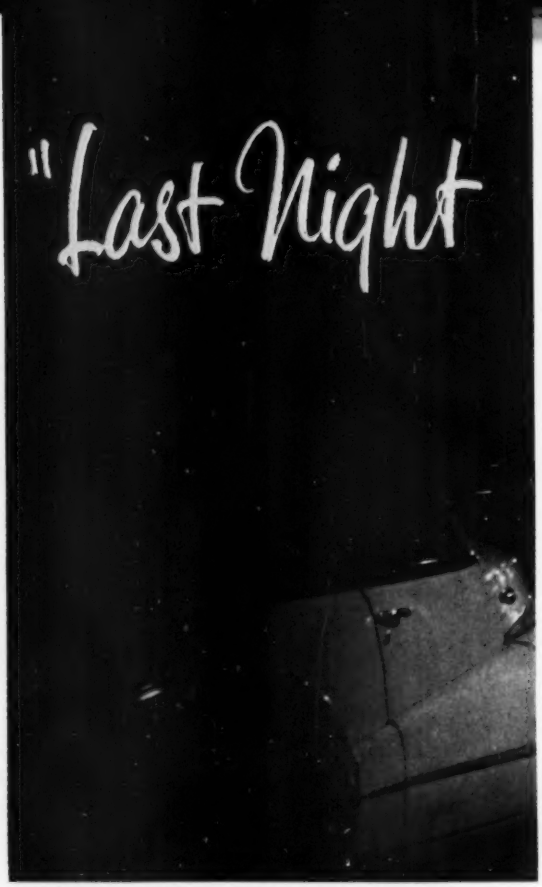
One Stolen Every 2½ Minutes

"We'll do our best," the officer said. "But we can't promise anything. Don't expect to see your car very soon."

My easygoing friend hasn't seen it and he probably never will.

The Federal Bureau of Investigation reports that automobile theft is now the nation's leading crime against property. In 1951, 197,000 cars valued at $190,000,000 were stolen. More than 16,000 of them, valued at $15,600,000 were never recovered. The average take for each stolen-car job was $965—more than four times the average loot for the next most lucrative crime, robbery. And the first half of 1952, car lifting increased 8.8 percent over the same period in 1951.

But the situation is not hopeless. The



1 A CAR IS STOLEN somewhere in the United States every two or three minutes. A window may be smashed or lock broken, but most

2 NO CAR? That's right, no car! Dimly lit streets are thieves' favorite hunting ground, as are places where cars are left for definite periods, such as commuter stations.

My Car Was Stolen..."

thieves prefer to force ventilator window, open door from inside—it's quieter, damages car less. Then they short ignition and start motor. Some criminals obtain duplicate keys from pals in auto agencies, parking lots, garages. A few brazenly tow car away.

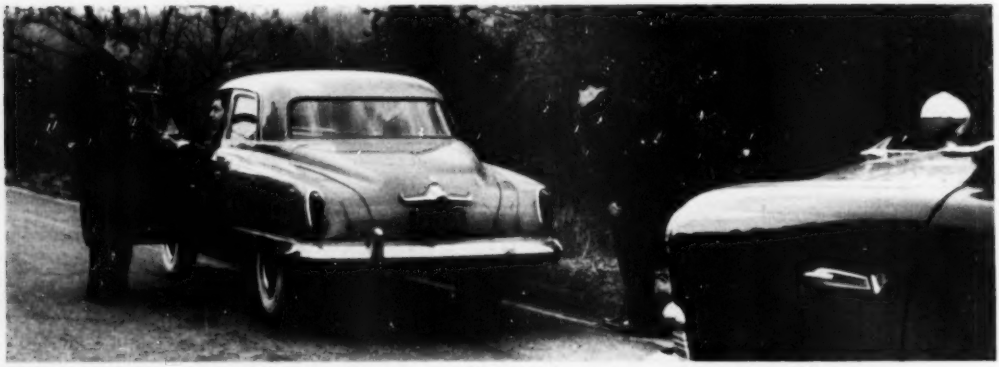
3 GOT THOSE FIGURES? License, registration, engine and chassis numbers are all vital in tracing a stolen car; should be kept in your wallet. Never leave papers in auto.

4 CALL THE COPS right away—and give them all the data you have. Your own secret marks on car help—you can use the invisible ink with which laundries mark clothing.

5 THIEVES DISGUISE a "hot" car first thing. In hideaway garage or "drop," they change plates, alter motor and serial numbers, often repaint body. Accessories may be removed.

6 COPS GET ON THE JOB at once. Car is listed on "hot sheet" going to stolen-car squad, nearby police, state troopers, motor vehicle bureau and National Auto Theft Bureau.

7 ALARM IS FLASHED to all squad cars. Sometimes they can pick up car before it reaches hideaway. About 90 percent of stolen cars are found—but often stripped or smashed.



8 CAR THIEVES are arrested with due care—they're dangerous. One recently killed a Connecticut trooper who stopped him; suspect was caught later with another stolen car.

auto thief must reckon with more than the local police. Arrayed against him is the National Automobile Theft Bureau, an organization maintained by more than 300 insurance companies, which keeps a stolen-car file for the entire U. S. If a stolen car is taken over a state line, the FBI also enters the picture.

But the fellow who can do most to solve this problem is the motorist himself. According to the American Automobile Association, a five-year survey in one city revealed that 92 percent of the autos stolen had been parked with the key in the ignition lock. Some cities now forbid this, and violators must buy their keys back from the police.

The FBI says there are three main types of car thieves: (1) the joy-rider thief who commonly abandons the car after taking a jaunt in it and possibly wrecking it; (2) the transportation thief who uses the stolen car in the commission of another crime and then abandons it; (3) the commercial car thief whose business is selling stolen cars.

How Auto Thieves Operate

A thief's first step is to spot the car to be stolen. He may specialize in one type of car. Sidney D. Hurst, now in a Federal institution, allegedly stole 48 late-model Chevrolets in and around Alexandria, Va., in four years. Gangs may accept orders from customers for cars of certain year, make, model and color, and hunt only for those. A Wisconsin ring would browse through auto-sales agencies and look at the addresses on the work sheets of new cars. Shortly after delivery, they would steal the cars.

The "hot" car must be disguised quickly. Besides changing its numbers and appearance, this includes altering the ownership papers, since the buyer must register the car. Registration and title papers may be forged. Or the papers of a wrecked car may be used for a stolen vehicle.

Stolen cars are often sold through newspaper ads. They are also unloaded on used-car dealers. Or they may be sent to a foreign country. Recently, the FBI broke up five New York and New Jersey rings that specialized in de luxe cars which they sold abroad for as much as $7,500 each.

Isn't there some way in which a car can be made thief-proof?

Inventors have come up with all sorts of gadgets. Some flash a warning if you leave the key in the lock. Others sound alarms if the car is tampered with.

The car thief is in a hurry, and he wants to be unnoticed. Delay him, and make him attract attention. The amateur or joy-rider thief steals most of the cars. Typically, he's a teen-ager or a drunk who won't work very hard to get the car. Usually, he won't even try unless the key is in plain sight. To him a locked ignition switch, closed windows and locked doors are real barriers.

Two Ignition Switches Foil Thieves

The professional expects to find locks barring his way and he's prepared for them. But he can't spend hours working on a car parked in a residential neighborhood. And he can't afford to make noise.

[*Continued on page 230*]

TIPS FROM THE FBI

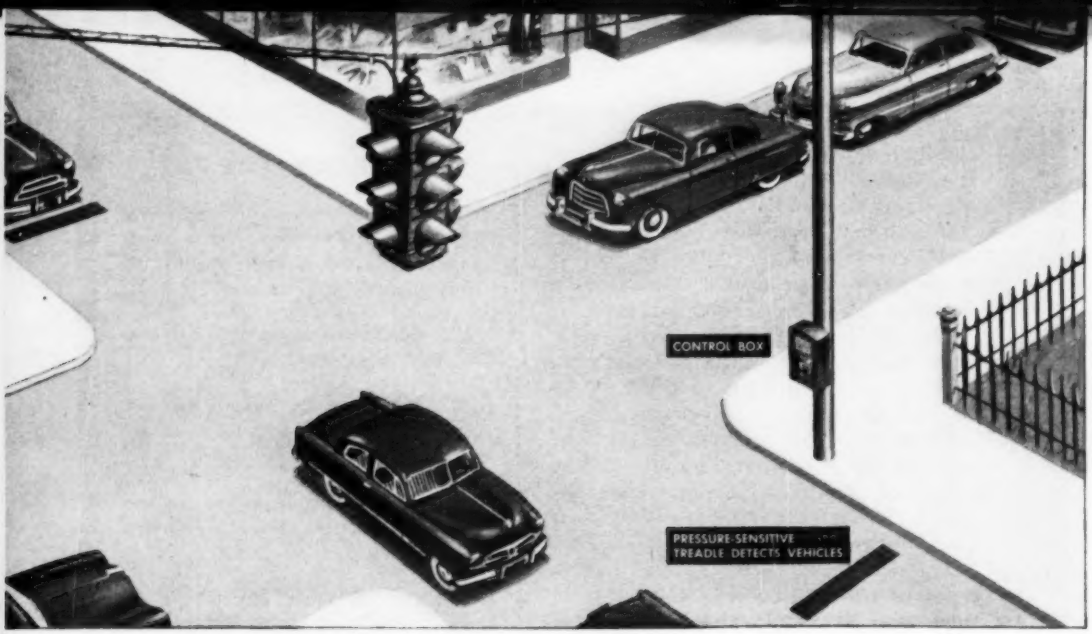
J. Edgar Hoover, *FBI director, stresses good parking habits as a basic precaution against car thieves. Here are his suggestions:*

"1. Lock both ignition and doors. Recheck to be sure.

"2. When possible, avoid parking in unlighted areas or overnight on the street.

"3. Do not leave a parked car for extended periods without a periodic check as to its safety.

"4. Do not leave any article of value in a parked car where the article can be seen by a passerby."



Stop Light Counts the Cars to Speed Traffic

THEY'VE hooked a traffic light to a brain now. It counts the number of cars approaching an intersection from each direction and gives the longer green light to the street with the heavier traffic load. Developed by General Electric, the light also saves time by cutting the green-light period to match just the number of cars that want to go through, instead of allowing a long, fixed minimum as do present models. The light is actuated either by pressure plates in the street or a magnetic detector.

Sea-Dart Emerges from Water

HERE's what the Navy's new XF2Y Sea-Dart (PSM, Feb. '53, p. 107) looks like ashore. Retractable hydro-skis enable the Convair twin-jet fighter—the world's first delta-wing seaplane—to take off and land on rough water.

Rubber Blocks Engine's Shakes

PATIENTS will get an extra-smooth ride in this emergency ambulance used in Columbus, Ohio. The black strip between the engine hood and the cab, shown below, is hard-rubber insulation that cuts off engine vibrations from the body.

Broad Prop Adds Thrust

THESE prop blades—widest ever built—will spin on the Navy's turbo-prop Super Connie, due to fly this year. The hollow steel Hamilton propeller is filled with vulcanized synthetic foam for added strength.

Regardez, Sans Mains!

OR, "Look, no hands!" The Paris model's trick umbrella, shown at right, doesn't have to be held. A belt anchors the handle at the waistline and a lapel clip keeps it upright.

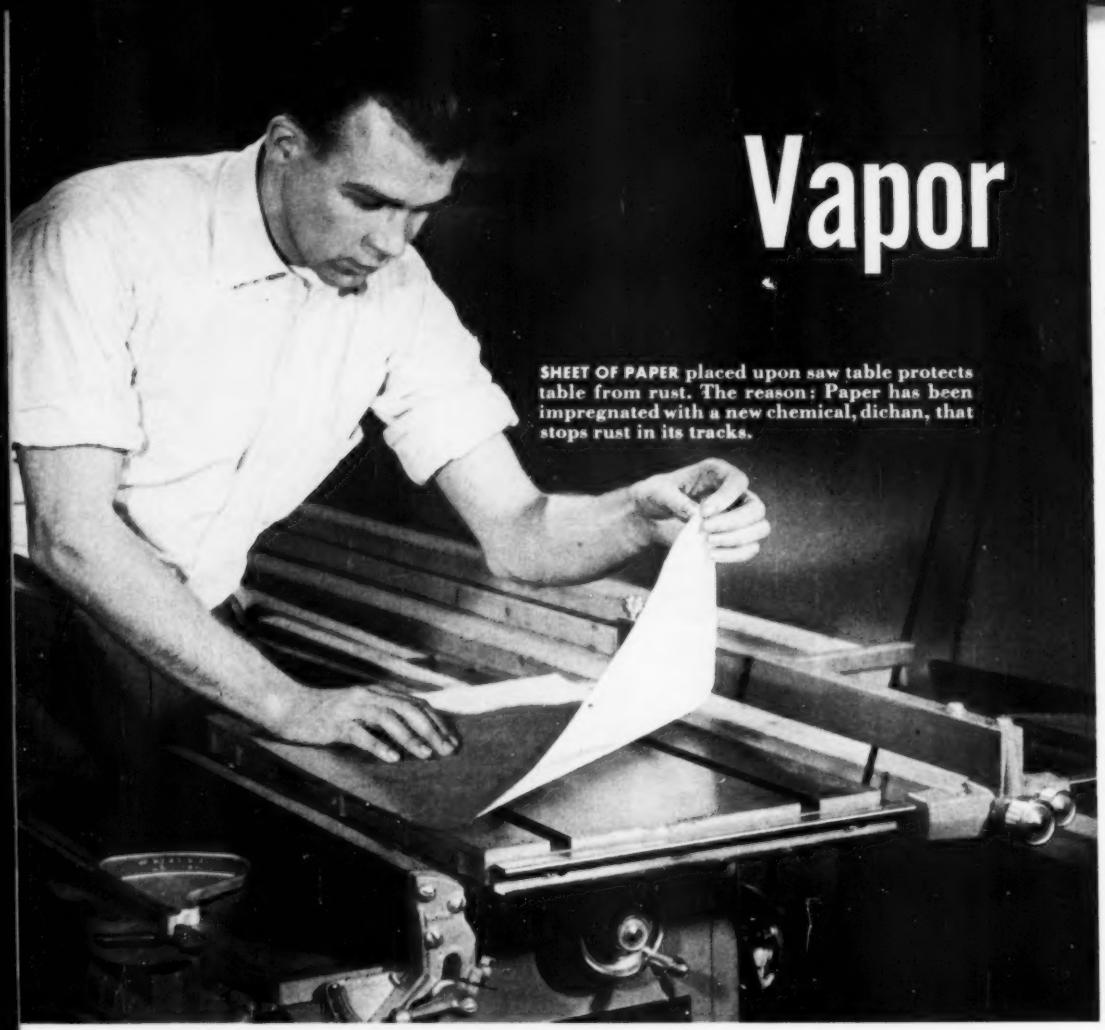
Numbered Patrol Car, Police Plane Team Up for Man Hunt

YOU see the last act of a man hunt in the picture at right. A prisoner has escaped from Jackson Prison in Michigan, and the alarm has been flashed to the state police. The pilot of the troopers' Beechcraft Bonanza—you can see its shadow at top center—has just spotted the fugitive in a distant field and is now giving directions by radio to cops in the patrol car. The huge numbers on the roof of the car, which every Michigan state-police patrol car carries, enabled the pilot to identify it fast.

A few minutes after this picture was taken, the fugitive was caught by a trooper carrying a walkie-talkie, who was guided to the spot by radio from the patrol car.

When not spotting criminals, the state's two planes hunt traffic bottlenecks and fly mercy missions.

Vapor



SHEET OF PAPER placed upon saw table protects table from rust. The reason: Paper has been impregnated with a new chemical, dichan, that stops rust in its tracks.

Chemical protects tools, guns or fishing tackle by setting up a smoke screen that prevents oxygen from combining with metal.

By Gardner Soule

YOU can protect the tools in a chest from rust simply by shaking a few tiny crystals into the chest.

You can keep a rifle in a case from rusting by spraying a colorless liquid on the fleece of the case.

You can apply power brakes to rust on the table of a drill press or saw in a damp basement by covering them with a square of coated paper.

The crystals in the tool chest, the liquid in the gun case and the coating of the paper on the tables all are a chemical named dicyclohexyl ammonium nitrite.

This name is so long that it breaks even the chemists' jaws. So they call the stuff dichan, pronounced "dye can." It is a volatile nitrite salt that stops rust right in its tracks; if no rusting has begun, dichan keeps it from starting. Its potential saving around the home and in industry,

Keeps Rust Away

where loss from rust amounts to six billion dollars a year, is tremendous.

There have been, of course, many rust stoppers before—grease, oil, paint, petrolatum, others. Almost all were coatings on metal. Dichan isn't.

Nor is it a substance, like silica gel or calcium chloride, that prevents rust by soaking moisture from the air.

Dichan has a trick neither the coatings nor the moisture-absorbing substances have: It vaporizes.

Dichan continuously sends into the air a vapor that keeps the oxygen of the air from combining with metal. This oxidation—this combining of iron or steel with oxygen—results in rust.

Has Limitations, Too

Water or moisture must be present for rusting to occur. But water containing dichan blocks rusting. The dichan halts the marriage of oxygen and the metal.

Because of the vaporizing, dichan's trade name is VPI—for Vapor Phase Inhibitor. Although it can protect by contact, as in the case of the paper on the tool tables, it does not have to touch the metal it guards. The metal can be up to a foot or so away from it.

The vaporizing that is dichan's great virtue also imposes its limitation: dichan must be used in a closed container of some sort—a drawer, tool chest or box—or the object to be protected must be wrapped in kraft paper. The container or paper keeps the vapors from wandering away. No hermetic seal is needed—just a vapor barrier.

Because of the need for the barrier, the size of objects dichan can rust-proof is limited. It does, however, protect successfully the insides of big tanks on truck trailers, and Diesel engine parts from

SPRAY of dichan and alcohol from squeeze bottle will keep screws rust-free for a year. Dichan doesn't require alcohol. It can even be mixed with water to make a rust preventive.

DICHAN POWDER, sprinkled into toolbox, keeps tools rust-free. No matter whether you use dichan as a powder, as a liquid or on paper, you get same result: No more rust.

General Motors' Electro-Motive Division.

Valves, block rods, piston pins and about 19,997 other parts formerly underwent a complicated process of rust-proofing that involved (1) dipping the parts into two solutions, one flammable, (2) covering with wax paper and (3) crating. Now these same locomotive parts are simply shipped in fiberboard cartons protected by sheets of dichan paper. No dipping. No flammable solutions. No wax paper. No crates and additional weight. Savings run to millions of dollars a year.

Scientists Take It Home

Dichan was discovered during World War II at the Shell Development Co., Emeryville, Calif., where Dr. Aaron Wachter and his associates were looking for improved rust preventives for military use. The war ended and Shell tried to find industrial uses for dichan. Meanwhile, some of Shell's scientists took dichan home to see what it would do in their workshops.

Dan Hendricks of Shell Oil (associate company of Shell Development) wrapped up his photographic enlarger in it, and left it in a damp basement. No rust.

Al Black, a senior engineer at Shell Oil, perfected the simplest way of all to safeguard tools in chests, boxes or stored in drawers as his tools are. He strews dichan crystals once a year over any drawer lining whatever—just like seasoning a steak with a salt shaker. No rust.

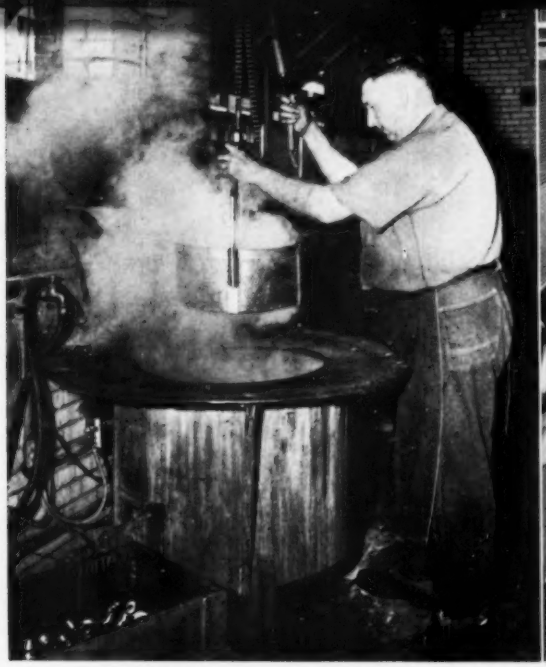
COMMERCIAL USES of dichan are shown in these three photos. Here Ernest V. Simmons of General Motors wraps blade rod of Diesel locomotive in dichan paper for rust stoppage.

You can protect a power snowplow if you use dichan powder inside the engine, and muslin bags of the powder tied on its outside, and if you cover the entire plow with a tarpaulin or dichan paper.

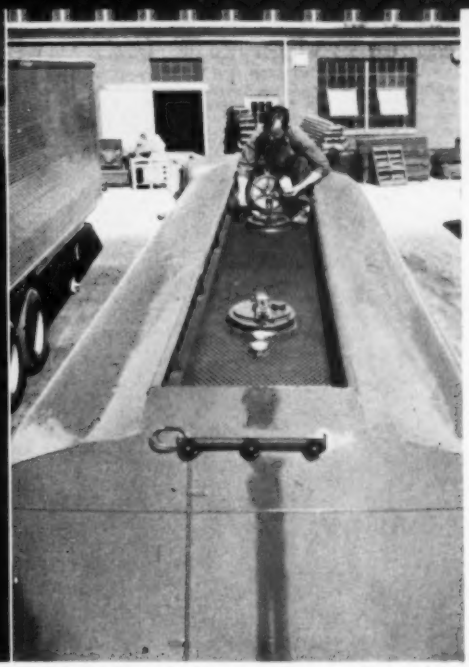
This is a method proved by Pan-American and a dozen other airlines on aircraft engines. Formerly the engines were rust-proofed with oil and grease and it took hours to get the gunk off and out. Today dichan is sprayed into cylinder bores and spark-plug and other holes. The holes are plugged with plastic caps (which act as the needed vapor barrier). The engines are festooned with bags of dichan on their outsides and wrapped in dichan or kraft paper. When unpacked, the engines are started and the heat at once vaporizes remaining dichan out through the exhaust.

At Wheeling Steel, the interiors of metal drums are sprayed with dichan. A tank trailer manufacturer, Fruehauf, protects brand-new 4,500-gallon tanks. A

HOW IT WORKS: When water is present, oxygen from air combines with metal to form rust. Dichan crystals (under nail in drawing) send off vapor that envelops any nearby metal object. Under vapor cloud, an invisible film forms on surface of metal. The film prevents metal from rusting. Composition of the film is still debated by chemists.



DIP TANKS are used at Boston Gear Works to clean metal parts prior to dipping into dichan solution. Treated parts are stored in tote boxes. Boston Gear cut rust 95 percent.



TABLESPOON of white powder in each manhole of tank trailer, says Fruehauf, stops rust even though trailer is left in open. Such rust in the past was a constant, costly problem.

British automobile company ships unpainted parts, protected only by one layer of dichan paper, all the way from London to India and Australia.

At the Boston Gear Works, parts are protected by dipping them into a dichan solution then storing the parts in closed containers. A watchmaker inserts a scrap of dichan paper smaller than a postage stamp behind the works of his watches.

But of all the uses today, perhaps none gratifies Dr. Wachter, the discoverer of dichan, more than the military uses he sought from the start.

Guns Now Cleaned Quickly

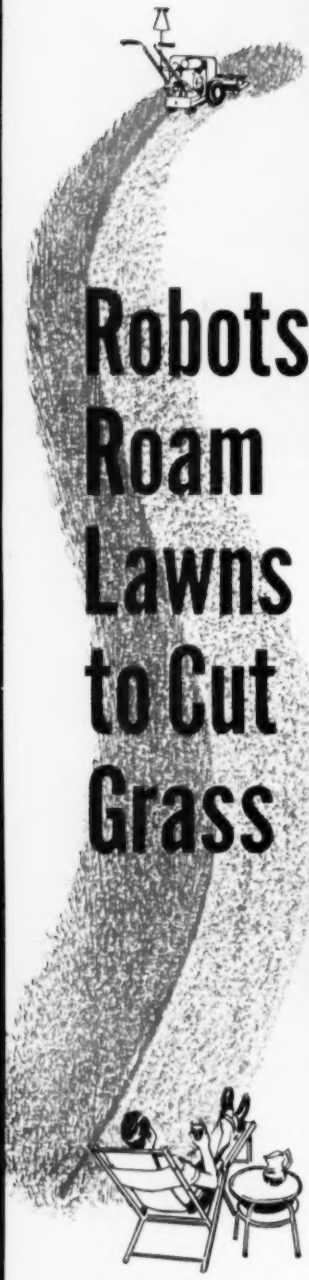
Formerly, machine guns and army rifles were shipped in heavy coats of petrolatum. This meant a two-hour-and-45-minute degreasing job when a gun arrived. Today, guns are shipped with coats of light oil only, and within a dichan paper wrap. Two minutes after reaching the front they can be fired.

You will probably not need much dichan. An ounce or two of the powder will suffice in a household for years if it is not wasted. The cost will be around $1 an ounce. If you do apply more than is needed, it will not harm a gun, fishing tackle, ice skates or any other metal object. Dichan in a capped bottle will retain its power for over 10 years.*

If you insist on breathing the fumes right out of the bottle for a long period, you may get a throat irritation, but a few whiffs won't hurt you. Dichan does not irritate the skin. It has very few adverse effects on nonferrous metals and does no harm to brass, bronze or aluminum. As for nonmetallic substances, it has harmed seriously only two of hundreds of things on which it has been tested: Pliofilm (rubber hydrochloride) and some lacquers.

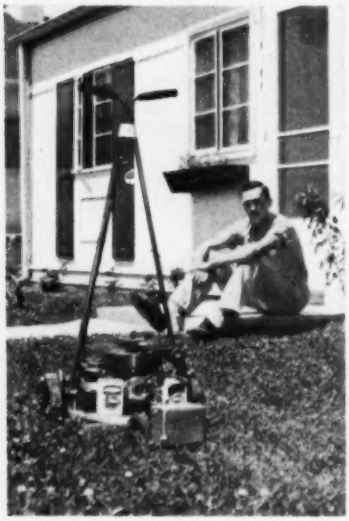
Dichan paper used in a drawer should be replaced once a year. In a sealed package, dichan paper will be effective for years. You need to replace the crystals (either if you use the powder form, or the liquid, which leaves crystals) only when crystals are no longer visible. END

**To inquire how to buy dichan, write the Lubricants Department, Shell Oil Co., 50 W. 50th St., New York 20, or 100 Bush St., San Francisco 6, Calif., and say what you want it for.*



Robots Roam Lawns to Cut Grass

Electronic Nose Sniffs Out Tall Grass

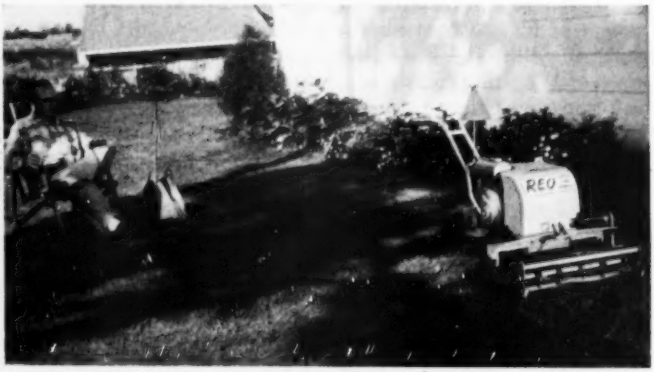


It beats boy power. This self-steering mower eats only while it works, never talks back and can't loaf on the job. It follows border of uncut grass (foreground above).

ALL the handle on this mower is good for is guiding it into the garage. Raymond P. Meyer of Omaha built it to steer itself where the grass grows high.

He guides the machine only once around the outside of the lawn. From then on it runs clockwise around the uncut portion, no matter what the shape. Steered by an electronic nose in front, it shies away from clipped grass to hunt tall stuff.

Just why the nose is grass-seeking Meyer won't tell—a manufacturer has bought the idea and pledged him to silence until patent coverage is complete. Various guesses by those who have seen it work are that its feelers trip sensitive snap switches on contact with grass, emit radarlike impulses bounced back by



Two Push Buttons Steer This Radio Mower

TO SHOW that life can be beautiful, Reo Motors, Inc., equipped one of its standard power mowers with radio control. You can't buy one like it, but if you could . . .

To manicure the lawn (any size—what would you care?) you start the engine, aim the machine in the general direction, and find yourself a shady spot from which to oversee the job. Equipped with a tall drink, the transmitter and a two-button control box the size of your palm, you settle back in a lawn chair.

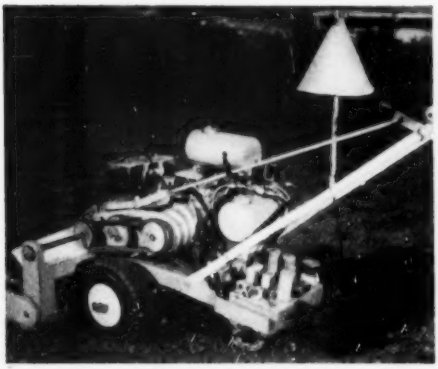
Pushing both buttons starts the mower running straight ahead.

the blades, detect grass by capacitance effects (which made early radios squeal when your hand came near) or send a tiny electric current through on contact with green stuff.

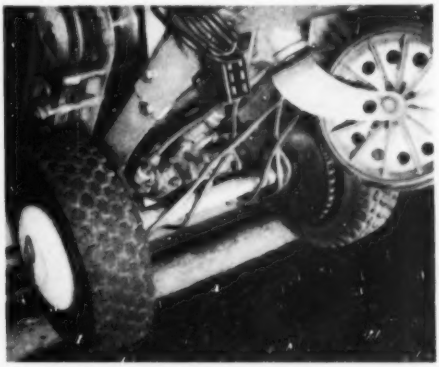
The power supply consists of two six-volt dry batteries. There is a vibrator that probably helps convert juice to a higher voltage. Relays triggered by the nose control power to the rear wheels, which perform the actual steering.

Not satisfied with what would make most men relax in contentment, Meyer is working on devices to control the machine on sloping turf and guide it around trees and flower beds. He also dreams of a mower that would start automatically, do its stuff and put itself back into the garage until the grass needed cutting next week.

The nose knows where grass grows high. Mounted on free-swiveling front wheels, it works relays (in cans at left of flywheel) that steer the machine by controlling power to the rear wheels. A rotary knife spun by the 14-lb., 1-hp. engine cuts a 14" swath. Wheels are driven from the vertical engine shaft by a right-angled V belt, a jackshaft, clutches, and pinions that engage rubber-toothed tires. Two lantern batteries supply electrical power. Total weight is only 52 lb.



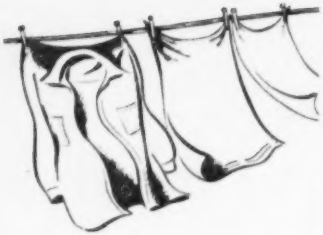
It's a dream walking. Transmitter in small bag with antenna on it (left in photo above) controls this mower from where you sit. Storage batteries on the machine operate the controls and receiver (over trailing wheel above). Funnel-like unit is receiving antenna.

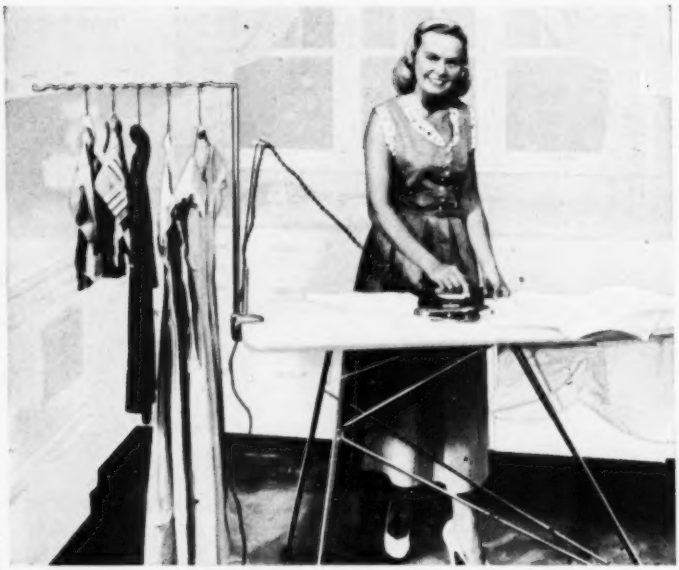


Hydraulic pump above mower axle powers the two rear wheels separately. Current controlled by the receiver operates solenoid valves in the hydraulic lines, driving either or both wheels. When only one is driven, mower turns. Engine runs at a fixed speed.

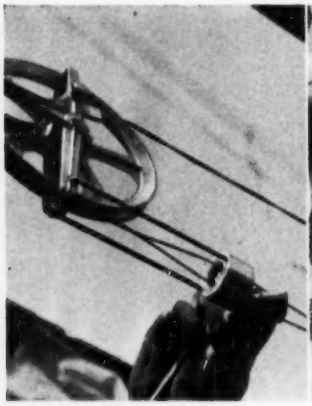
To turn left, you push the left-hand button; to swing right, the right. The trick is to keep directions straight when the mower runs toward you, for its right hand is then your left. To stop, release both buttons. There is a time lag of about a second before the machine responds, but you soon get used to it. If you're too tired to put the mower away when the chore is done, just push-button it into the garage. Having been foresighted enough to teach Junior how to shut it off, you can then take a nap.

These Lighten the Laundry





1. Steps are saved on ironing day if the laundress has a rack clamped to the board to take freshly pressed clothes. And keeping the cord out of the way makes the work go faster. The rods are lifted out when the board is stored; the clamp remains in place.



4. Wash is hung fast without pins on this stainless-steel line. A splicer and tightener is anchored at the pulley and as the line rides through, the double strand untwists, then locks the clothes in. On a walk-out line, the splicer is pushed along to receive or release wash.

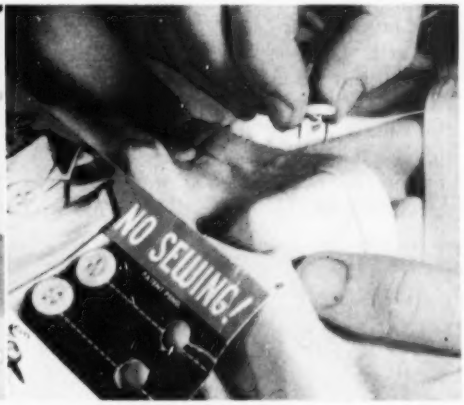
5. No more shopping for distilled water. A resin cartridge in the Distillo lets you use what flows from the tap. A single cartridge processes three to 10 gallons of water, depending on hardness of local supply. Cartridge changes color when a replacement is needed.

6. There's less guesswork in pressing trousers and skirts with this transparent pressing cloth. Before coming down with the iron, you can check the position of every pleat. The See-Thru cloth of treated organdy is also said to protect against scorching and to prevent shine.

2. Back bending is out when this lightweight trolley keeps the wash at a comfortable height. It slides along the line carrying clothespins in a side pocket. Canvas bag and metal frame fold for storage.

3. No more Charley horses. Wrestling with an ironing board is eliminated with this arrangement that slides out like a drawer, in position for ironing. There are no legs to get in the worker's way.

7. Less lifting is called for when the electric iron can be divorced from the steaming works for use without water. This steam attachment is designed for Tru-Heat electric irons with tapered heel for ironing backward as easily as forward. When not in use, the hot iron rests on its side.



8. Tempers stay sunny if shirts and pajamas are never missing a button. These buttons staple into place with a rustproof steel clip and have real thread on the tops to make them look handsewn. They can be attached in seconds, keep the mending basket empty.

Further information on these products can be obtained from: 1. I-K-I Products, Inc., Edgerton, Wis.; 2. Melvin G. Miller Co., P.O. Box 9124, Houston 11, Tex.; 3. The Kitchen Maid Corp., Andrews, Ind.; 4. Andrew Kazma, 104 West 84th St., NYC; 5. Ionex Corp., 348 Washington Bldg., Washington 5, D.C.; 6. Spencer Gifts, Atlantic City, N. J.; 7. General Mills, Inc., 1620 Central Ave., Minneapolis; 8. Spencer Gifts, Atlantic City, N.J.

Sports Racer Born from Bigtime Speedster

Frank Kurtis's new "500" can race with the hottest of the foreign

By Andrew R. Boone

THE man who has turned out more sports cars than anyone else in the country is mighty pleased with himself these spring days. He is a rangy Californian named Frank Kurtis, and the reason for his rosy mood is a new sports car that he calls the "500."

Kurtis believes his latest creation is the hottest thing ever offered in road racing. What's more, you can store it in the family garage and drive it to market or take it on a cross-country tour.

You can order a "500" to your own specifications, choosing the engine and transmission—automatic or manual—you want. Or you can get a kit of chassis and body parts to assemble yourself.

In looks the "500" would pass for a twin of Bill Vukovich's No. 26, also built by Kurtis, which set a flock of records before being forced out of last year's Memorial Day race at the Indianapolis Speedway after leading for 375 of the 500 miles. Hence the new car's name.

On a recent Sunday afternoon Bill Stroppe, whose light foot won the General Petroleum Economy run (Los Angeles to Sun Valley, Idaho) in '52, justified Frank's enthusiasm for the "500" by driving it in the 30-mile main event at

CUSTOMER SPECIFICATIONS call for 1,900 pounds of hand-tailored dynamite on wheels. Kit model is also available. Non-racing accessories, which include fenders, windshield, lights and license brackets, make highway driving legal in all states.

KURTIS KRAFT "500" is near-duplicate of racing car in which Bill Vukovich set the pace for 375 miles at 1952 Indianapolis classic. Over-all length is 178 inches.

competition cars—or take you down to do the family marketing.

Carrell Speedway, Los Angeles. Stroppe had qualified fastest. That placed him in 24th position—dead last.

The "500's" souped-up Mercury engine pulled him into fourth position on the first turn, after a run of 150 feet. He nosed into the lead on the third lap, and won the 14-mile dash easing up.

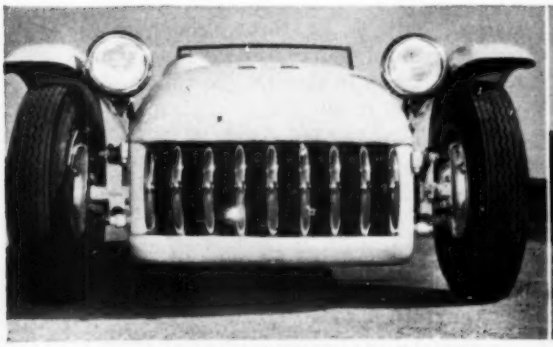
"The rear tires bit into the dirt real good," Stroppe said after the race.

That "digging in" accounts for part of the performance of the Kurtis "500." Tailored to compete with the Jags, Allards and Cunninghams, it takes off like a jack rabbit and stops like a cow pony.

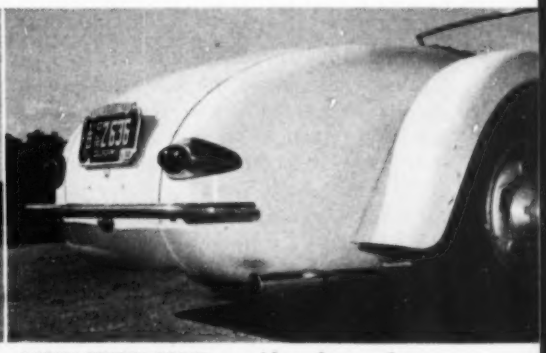
Riding is a bit stiff. There's a reason for that. You can't control a soft-sprung job at high speeds when cornering. A rigid frame is only one factor. Kurtis built roadability and safety into this "500" with a new stunt in springing. Dual torsion bars, front and rear, take the shocks. Set at a fore-and-aft angle, the front bars are crossed, with stabilizing arms extending forward to the outer ends of a solid axle.

"Independent front-end springing is okay," Kurtis tells you. "But at high speed during weight transfer the camber goes out of focus. Crossed bars help keep the wheels upright."

At the rear, parallel bars, attached to



ROAD-HUGGING "500," with 4.10-to-1 overdrive ratio, is good for between 120 and 165 m.p.h., depending on the power plant.



LARGE TRUNK SPACE provides plenty of room for baggage and spares being hauled to distant road race by two-man crew.

similar stabilizing arms, take the springing load. This clever arrangement increases the spring base for a smoother ride.

Frank Kurtis, the man behind the "500," learned engineering the hard way. Except for a six-months' night-school course in mechanical drawing, he enjoyed only half a year of high school training. Yet he hardly remembers a time when he wasn't busy designing a car that would look pretty, or perform better than anything on the road, or both.

He Souped a 1919 Ford

At 14, while working as a blacksmith's helper, he created his first sportster—turning a 1918 Ford roadster into a reasonable facsimile of a Stutz Bearcat. At 15 he converted a wrecked '19 Ford chassis into a 75-m.p.h. speedster, and three years later he proudly displayed his first streamliner. It sported several "firsts"—a spare tire concealed in the rear deck, glove compartment in right dash, instruments under the wheel, no running boards, skirted fenders, slanted grille and a hood extending back to the windshield.

But it wasn't until he reached the ripe age of 23 that Kurtis tackled a real racing car. Its four-cylinder, Model A block, with Creager rocker arms, was only a shadow of higher powers to come.

"The little wonder won a flock of ribbons for 'best appearance,'" he recalls. "But it wasn't very fast."

Midgets Put Kurtis in Big Time

That left-handed success whetted his appetite for more efficient design. In Glendale, Kurtis opened up a shop a little larger than a welding cabinet. Customers were scarce. Then one day in 1935 Kelly Petillo sent a hurry-up call to repair his wrecked Indianapolis car. That triggered a chain of events that led to more important successes. In '37, top Speedway driver Rex Mays dropped in for a chat.

"Frank," he said, "you've got to build me a midget. Lightweight. Plenty of chrome."

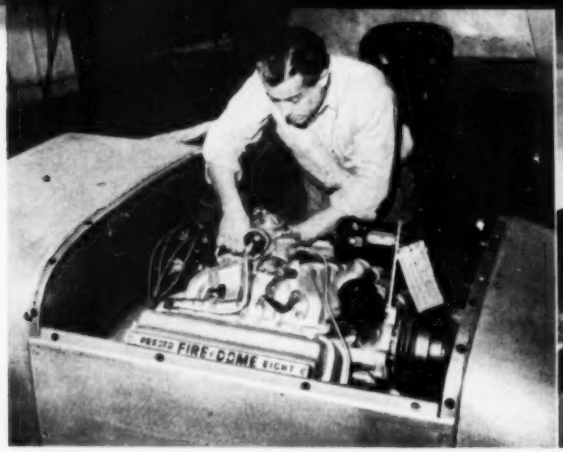
TACHOMETER AND SPEEDOMETER are to left and right of steering column, electrical group at center of dash. With racing engine and tires, "500" is ready for any track.

The old, hit-or-miss crop of midgets had seen their best days. Kurtis knew that they were dying and leaped at Mays' proposal. He roughed out a design. Better shocks. Soft, flatter springs. Mays went for it and in the next two years the Offenhauser-powered midget won him championships. Before the rage passed, Kurtis, in a new and larger shop, had built more than 600 of these little Offies. He still pushes several off his assembly jigs each year.

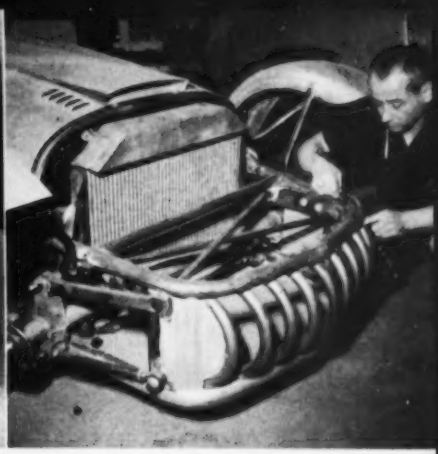
His first complete car to reach the Indianapolis Speedway carried Sam Hanks into the '41 time trials. A wrecked crankshaft sidelined that one and Kurtis went back to rebuilding entries made by other manufacturers. In 1946-47 he completed the ill-fated Novi front-drives. In '46, too, his Ross Page Special actually started, only to be thrown out by a broken crankshaft. Freddie Agabashian had better luck in that job the following year, placing tenth.

He decided to take a daring gamble. If others wouldn't buy his cars he'd enter them himself. Moreover, he would try a new type. The boys in the know took one look at its truss-tubular construction and dubbed it "the plumber's nightmare." Undismayed, Kurtis sent it to the wars. Here's the record:

Tommy Hinnerschitz brought it home ninth in '48. Johnny Parsons placed second and also won the National Cham-



DE SOTO EIGHT (160 horsepower) goes into second of 10 Kurtis sports cars built to date. Other engines specified by buyers include Cadillac, Chrysler, Hudson and Mercury.



STEEL TUBING serves as both bumper and grille. Cowl behind radiator is modified to meet engine requirements. Duct on hood (above) scoops air for De Soto carburetor.

pionship in '49. In '50, Parsons wheeled in winner of the 500.

Orders began to roll in. Kurtis built his famed 3000 series, then a somewhat lighter 4000. Now he has turned to the Vukovich type. To date he has constructed 75 championship cars, including dirt-track versions. Of the 33 starters in '51, 17 bore the Kurtis label, topped by 22 qualifiers in '52.

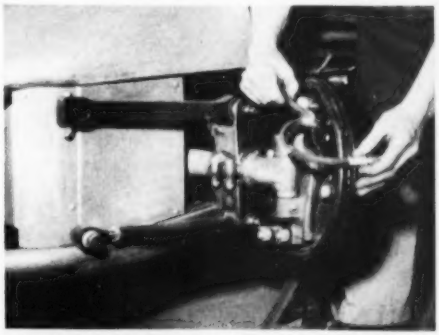
An Old Hand at Sports Cars

It's been 14 years since Kurtis produced his first "modern" sports car, a job which looked a good bit like today's Jag. By 1950 he was thinking in terms of a kit car (PSM, May '50, p. 136). Later that year he created the Muntz Jet (PSM, Dec. '50, p. 114). And now comes the "500"—evidence that Kurtis is convinced that the present boom in sports cars will stay and expand.

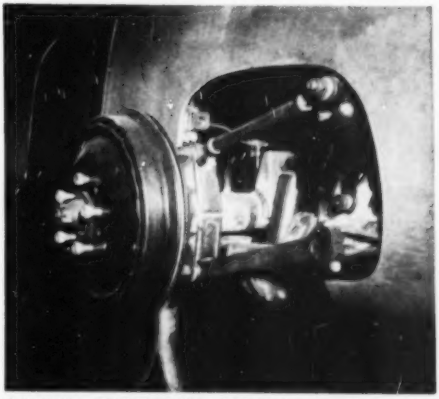
"Look how the big boys are getting into the act," he points out. "The Buick Riviera started the race, followed by the El Dorado, Skylark and Caribbean—all modified convertibles. They're functional beauties, but not quite sportsters."

Kurtis has nothing but praise for foreign cars. But with Yankee pride he's convinced that someone on this side of the Atlantic can do better.

"Why let them win most of the cups?" he asks. He may have the answer in his own "500." END



UNUSUAL SPRINGING gives fine roadability and cornering qualities. At front end, top arm is levered back to axle from torsion bar. Lower arm adjusts caster.



SIMILAR STABILIZING ARMS increase spring base at rear for smoother ride. Axle suspension is transverse. Four big drums give 660 square inches of braking surface.

Upholstery Sprayed with Color

Now you can spray new upholstery on dingy furniture or brighten faded canvas on garden chairs. Upholstery texture is unaffected, the maker reports.

Model Helps Sell Big Machine

EVEN though this salesman sells big industrial drilling machines, he can show his customers a sample—a quarter-scale model that he carries easily in a lightweight case made of Bakelite.

▶▶▶ A new bug-killing wax shines any kind of floor and discourages insects at the same time. Called Freewax, it contains Lindane insecticide.

Ghost Trucks Get the Works in Quiet Lab

PHANTOM trucks now roar across country day after day, uphill and down and leave no trace of their passing except in a spotless, soundproofed room located in Detroit.

Machines alone watch these ghostly maneuvers on the only indoor proving ground in the U. S. It was built by General Electric for the Timken-Detroit Axle Co.

Here, axle after axle is put through tests that exactly duplicate the experiences of rear axles on real trucks in actual cross-country runs.

The truck "driver" is a magnetic tape. On it is a detailed record of an actual test run outdoors. The notes for the record were taken by an observer who accompanied the driver on that run. Every time gears were shifted, engine speed varied or the road dipped or climbed, the observer made a note of the change and the time it took.

Actual Road-Testing May Be Eliminated

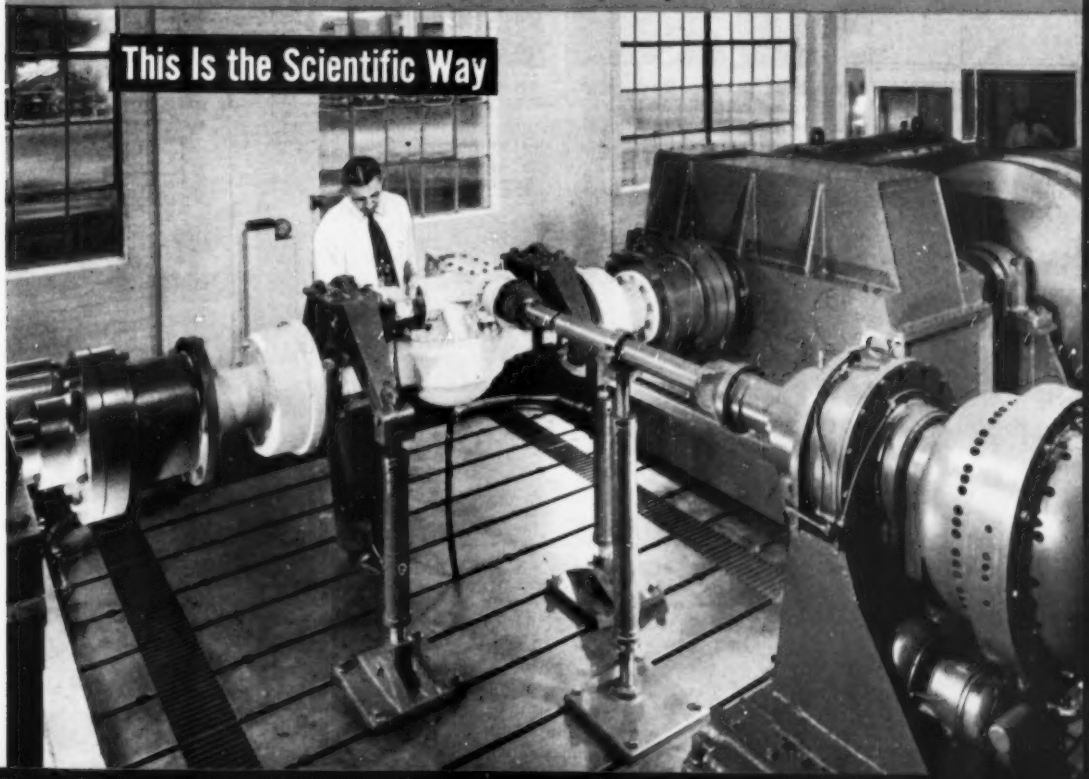
When the magnetic tape is played back on the control board of the new proving ground, it governs dynamometers that duplicate exactly what happened to the rear axle of the truck that made the actual run. Once Timken's library of magnetic tapes is extensive enough, road-testing may be eliminated entirely.

The indoor proving ground provides an ideal place to do detective work when mysterious quirks develop in axles in use on the road. The average route of the ailing axle can be recorded on tape, for example, and then the tape used to run an identical axle over the same "route" in the laboratory, under close observation.

Researchers, meanwhile, are trying to find an efficient way to make the magnetic-tape recordings in the field, so the trip can be duplicated in the laboratory as quickly as the tape can be delivered.

This Is the Old-Fashioned Way

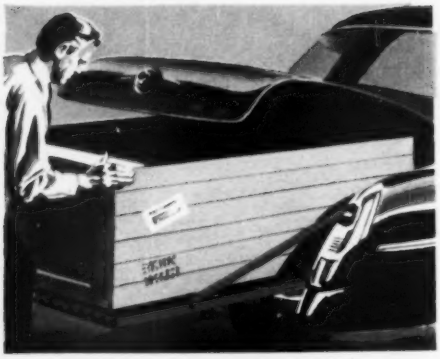
BLOW-BY-BLOW description of cross-country truck route is played back on a tape recorder in the Timken-Detroit axle-testing plant (below) where machines duplicate the strain of road shocks, grades and gear shifting. Axle being tested is linked to three dynamometers in punishing T formation. Unit in foreground acts as 450-horsepower "engine" the other two record performance in terms of torque output.



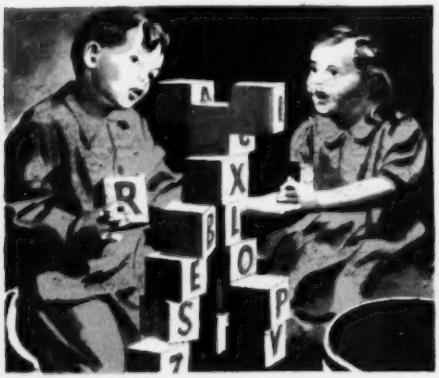
This Is the Scientific Way

I'd Like to see them make...

Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science Monthly* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.

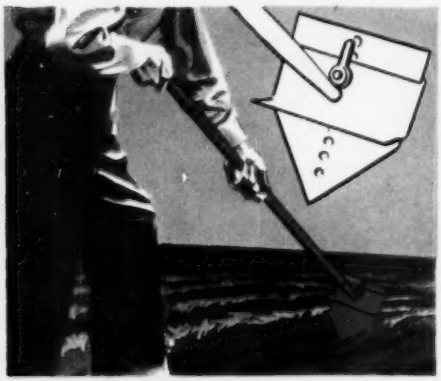


A PULL-OUT CARRIER that could be installed in a car trunk to help support long or bulky loads. In use, the end would clamp to the rear of car.—*V. Denton, Grand Haven, Mich.*



MAGNETIC BUILDING BLOCKS. Small-fry engineers could build more complicated structures and the topmost blocks wouldn't topple so easily.—*Mrs. Lily Sandrof, Gardner, Mass.*

AN OIL METER for car dashboard that would eliminate the dipstick routine by indicating how much oil is in the crankcase as well as oil pressure.—*T. Fujii, Monterey, Cal.*



A GARDEN HOE with a guide plate that could be set so blade would penetrate soil to a specific depth for preparing rows for small seed planting.—*C. B. Bailey, Puyallup, Wash.*

AN AUTOMATIC PEN that would write with phosphorescent ink. Fine for darkroom workers, X-ray technicians, scientists and movie critics.—*Llewellyn Holland, Wildrose, N. D.*

How They're Closing In on POLIO

Things are happening fast to raise hopes for final victory in this grim war—here's what you should know about it NOW.

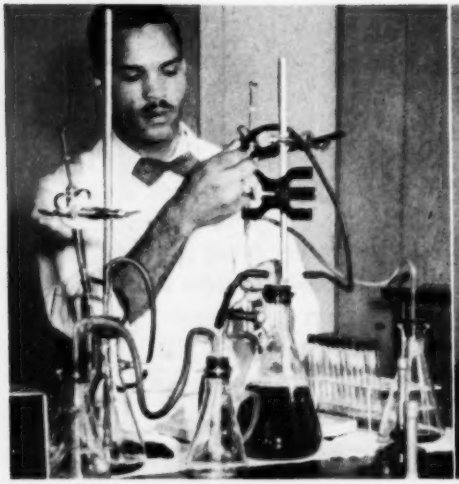
By Marguerite Clark

THE year 1952 was the worst in the history of poliomyelitis. Some 55,000 men, women and children were struck.

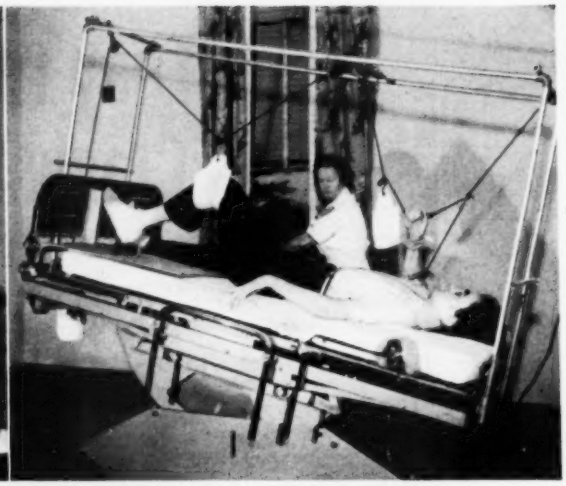
Yet 1952, a year of tragedy, brought progress that makes 1953 a year of bright hope. Polio researchers, backed by March of Dimes funds, have developed a safe and inexpensive vaccine that one day will give long-time protection against this disease.

Sometime this spring or fall there will be large-scale vaccinations, possibly of as many as 25,000 children. By 1954, if the National Foundation of Infantile

ONE OF 55,000 CHILDREN gets his gamma-globulin shot in huge field test last summer. Results showed GG gives temporary polio protection. It will be used in epidemic areas this year.



SUCCESSFUL POLIO VACCINE was speeded by discovery that polio virus could be grown in test-tube cultures of non-nervous human tissues, shown above getting liquid feeding.



ELECTRIC ROCKING BED simulates walking motion for polio patient. Tilting also helps patient breathe by pushing abdominal organs against lungs, then dropping them back.

Paralysis feels that the time has come for public vaccination on a mass scale, all the children in the United States may get the vaccine.

Scientists Worked 14 Years

Here are the steps by which the scientists, after 14 years of intensive research, reached their final goal:

1. Polio is caused by a virus so small that it cannot be detected, even through an electron microscope. For a long time, researchers have known that this virus has several strains. And before a polio vaccine, effective against *all the strains,* could be made, these various strains had to be identified. After three years, and at a cost of $1,400,000, scientists at four universities—Utah, Kansas, Pittsburgh and Southern California—proved definitely the existence of three strains of polio virus—Brunhilde, named for a chimpanzee used in a polio experiment in Baltimore; Leon, for a Los Angeles boy who died of the disease; and Lansing, for a young man in Lansing, Michigan, who had a fatal polio attack.

2. Once scientists had used the infected spinal cords of laboratory monkeys as the sole source of polio virus. But this infected substance, when injected into human beings, could bring on a dangerous allergy, or even death. So hope of developing a safe vaccine seemed slim. Then Dr. John F. Enders of Harvard worked out a new technique for growing the polio virus in test-tube cultures of ordinary human tissues. The new substances, which contained all three polio strains, were easy to make and safe to inject in human beings. From that time on the search for a polio vaccine was less difficult.

3. The vaccine which soon will be ready for large field trials, and is the key weapon in the victory against polio, has been prepared by Dr. Jonas E. Salk of the University of Pittsburgh. It is made of inactivated virus, incapable of causing infection and damaging nerve cells but still powerful enough, when injected into an animal or a child, to build up antibodies against polio. Shots are given in mineral oil, a substance which seems to stimulate the forming of antibodies. Dr. Salk's vaccine contains all three strains of polio virus—Leon, Lansing and Brunhilde; it is made easily and inexpensively in test tubes, using the Enders technique. From the start, the

"COUGHING MACHINE," developed by Dr. Alvin E. Barach of Columbia, rids paralyzed patient of strangling phlegm by sudden compression of air on chest and diaphragm.

MYODYNEMETER tests patient's muscle strength electronically after polio attack, so rebuilding can be planned. Dr. Willis Beasley, of U.S. Public Health Service, developed it.

vaccine was successful in protecting laboratory monkeys and chimpanzees against polio. Since polio in monkeys and chimps follows the human course of the disease, the researchers did not doubt that a similar vaccine would prevent polio in children. Controlled tests on boys and girls followed. None developed polio, but all began to build a supply of antibodies to fight it.

For the coming polio season, it is expected that the vaccine field trials will follow the plan used in 1952 when gamma-globulin shots were given to large groups of children. Half of the youngsters will get the vaccine; the other half, harmless shots of a substance that will resemble the vaccine but with no polio-fighting power. Later, blood from the vaccinated children will be tested, and the level of the polio-fighting antibodies will be compared with that in the children's blood before vaccination and with that of the children who got the vaccine substitute.

Meantime, the use of gamma globulin will continue. This development, although overshadowed by the vaccine, promises to be a powerful weapon against polio until the vaccine is perfected. For a long time, polio investigators have tried to find the time and place to immunize a patient against polio before the virus enters his nervous system (brain and spinal cord) and causes paralysis. In the spring of 1952, Dr. Dorothy Horstmann of Yale University and Dr. David Bodian of Johns Hopkins discovered that the polio virus, entering the body through the mouth and traveling through the digestive tract, stays in the blood stream for a few days before it moves on to attack the nervous system.

Gamma Globulin First Tried on Monkeys

This gave the researchers a lead. Why not try to immunize patients against paralytic polio while the virus lingered in the blood stream? As yet, there was no vaccine available. So Drs. Horstmann and Bodian gave small doses of gamma globulin (the blood fraction which contains antibodies to fight polio) to laboratory monkeys previously infected with polio virus. When the gamma-globulin shots were given, the animals did not develop paralytic polio; when they were not given the shots, they were paralyzed within 10 to 15 days.

On the basis of the successful experi-

TRICYCLE with special attachments helps young polio patient re-coordinate arms and legs. Only half of acute polio cases are crippled: half of these have no serious handicap.

BASKETBALL is played by wheel-chair patients to rebuild weakened muscle fiber. Exercise is a vital part of rehabilitation. Most of National Foundation funds go to patient care.

ments with monkeys, plans were made to set up the now famous gamma-globulin tests on children. In Provo, Utah, Houston, Texas, and Sioux City, Iowa, polio researchers under Dr. William McD. Hammon of Pittsburgh, proved beyond doubt the power of gamma globulin to prevent the paralytic form of polio in human beings. In these three large field tests, which cost the National Foundation for Infantile Paralysis over $1,500,000, the American Red Cross furnished enough gamma globulin to immunize 55,000 children. One injection protects a child for a period of five weeks following exposure to polio.

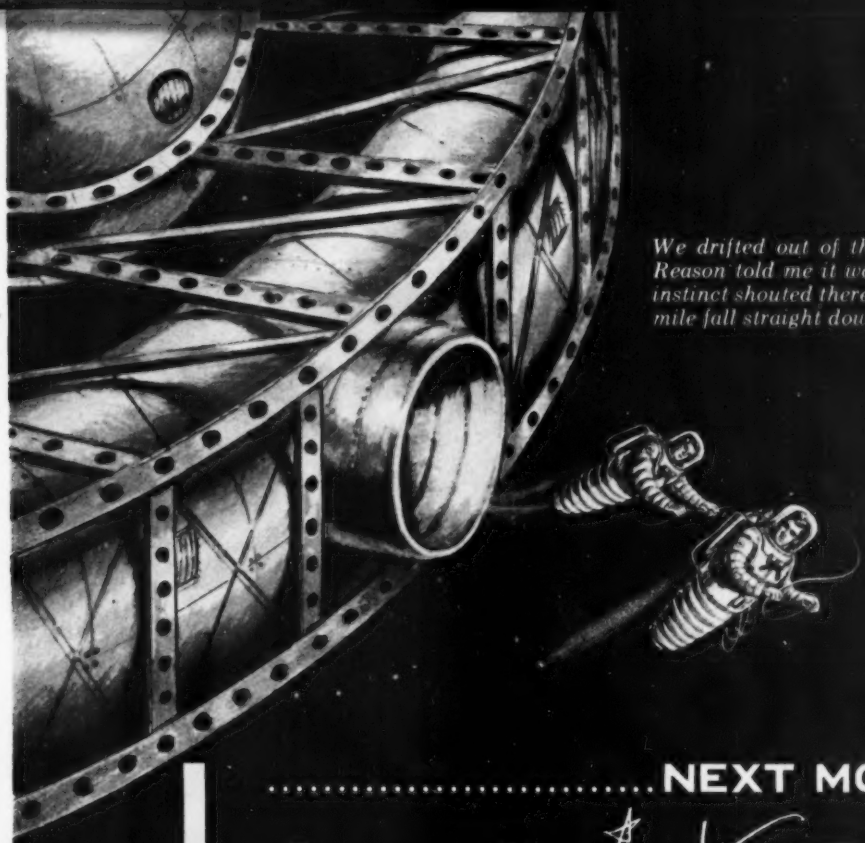
Blood Donors Needed to Fight Polio

It takes about a pint of whole blood to make an average dose of GG to use in polio. To get enough of the serum for the needs of the 1953 polio season, the Red Cross has expanded its blood-collection program. The Red Cross will gather and process the blood and turn the gamma globulin over to the Office of Defense Mobilization. There, the blood derivative will be allocated to state health officers, who in turn will be responsible for its local use in measles, infectious hepatitis (a serious virus disease of the liver) and infantile paralysis in epidemic areas. Because of its scarcity, GG will be given to children from one to 11 years only.

It has cost the National Foundation for Infantile Paralysis over $18,000,000 to reach the point where immunization can be promised. At the same time, the largest share of the March of Dimes funds (about $140,000,000) has been spent on polio patients' medical care during illness, and on expert rehabilitation therapy. More money will be needed for them, and for future victims of polio. But the dramatic research achievements of the last two years renew hope that soon every parent will be freed from the dread of infantile paralysis.

Until then as every polio specialist emphasizes, good treatment given promptly will help thousands of polio victims to recover with little or no after-effects.

[*Continued on page 232*]



We drifted out of the air lock. Reason told me it was safe, but instinct shouted there was a 500-mile fall straight down.

.....NEXT MONTH:

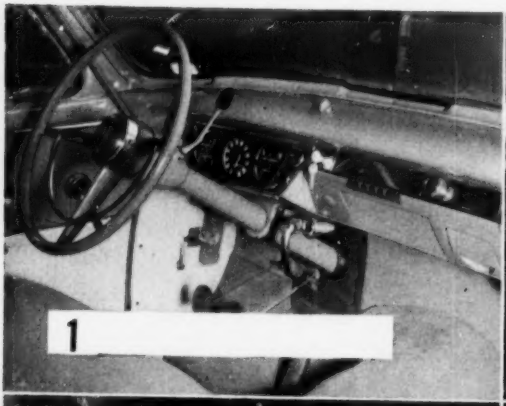
Islands in the Sky

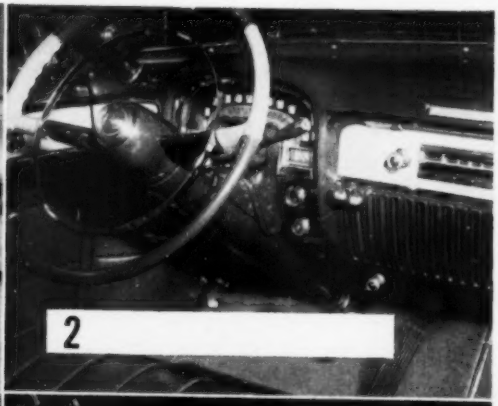
WHAT would it be like to live where you have no weight, where a careless step may shoot you up to the ceiling, where you can drift in empty space 500 miles above the earth and not fall? ISLANDS IN THE SKY tells you. It is the vivid story of a young man's visit to the space stations permanently circling the earth in the Twenty-first Century.

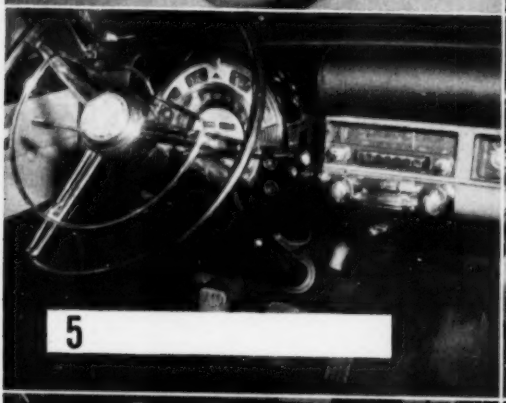
Written by Arthur C. Clarke, an English physicist, ex-radar specialist and chairman of the British Interplanetary Society, this is fiction that foreshadows tomorrow's fact. Like Jules Verne's famous novels, it is so outstanding that the editors of POPULAR SCIENCE MONTHLY believe every reader should have the opportunity to enjoy it.

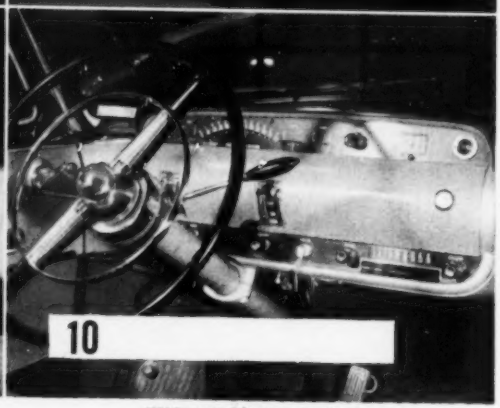
A condensation of the book, complete in one issue, will appear as a special section in POPULAR SCIENCE MONTHLY for June.

What Car Are





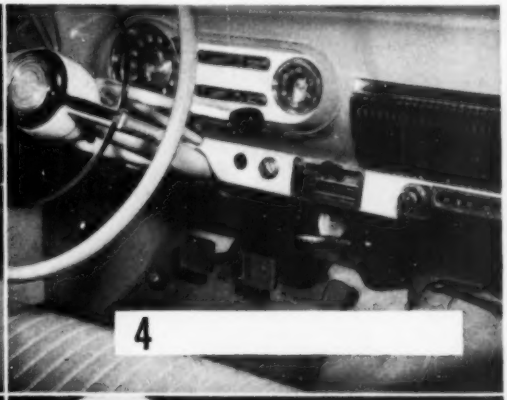


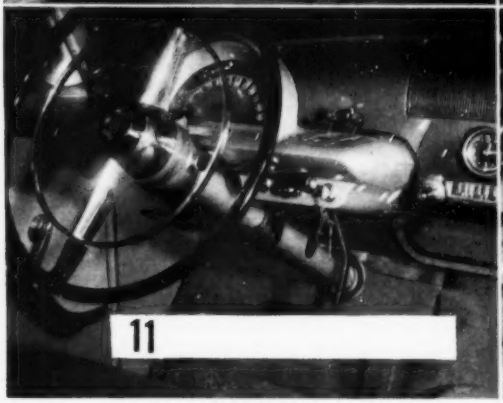


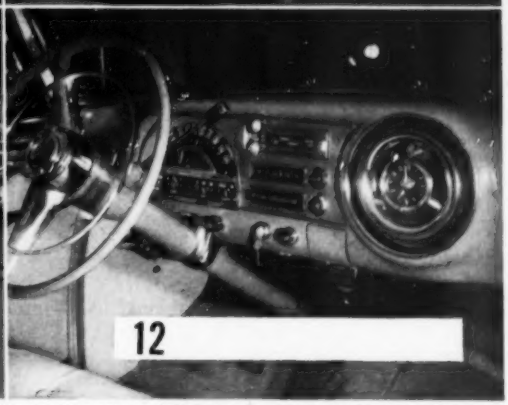
10. Lincoln; 11. Mercury; 12. Pontiac.

You In?

THESE photos show dashboards of 1953 cars. Test your A.Q. (Automobile Quotient) by trying to identify them. Then check answers at bottom of these pages.







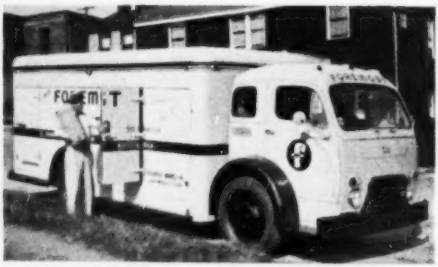
Answers: 1. Studebaker; 2. Cadillac; 3. Dodge; 4. Chevrolet; 5. Chrysler; 6. Packard; 7. Ford; 8. De Soto; 9. Buick;

Sight-Seeing a la Carte in a Bicycle-Built-for-a-Mob

THIS pedal-operated pushcart is an Italian inventor's answer to the harassed tourist who is trying to get in some sight-seeing with a bevy of youngsters along. It is shown touring the streets of Rome but it would work out equally well in the home town for baby trucking and hauling home the weekly groceries.

Plastic Drawer Can Be Dunked

A ONE-PIECE, smooth-working furniture drawer of black plastic can be washed like a dish. There are no joints to separate and the Bakelite won't shrink, swell or warp. The Warren Furniture Mfg. Co., Paterson, N.J., uses them in chests and tables.



Low-Slung Truck Packs More

BECAUSE it is 12 inches closer to the ground than any other truck with a low-bed frame, this delivery wagon puts more of the load within easy reach of the driver, loads and unloads faster and holds more, according to the maker. White Motor Co., Cleveland.

PUSH BUTTONS on steering-wheel hub operate automatic transmission, eliminating selector lever. Horn is sounded with a foot pedal. An aircraft-type pedestal houses controls for air conditioning, lights, radio, windshield wipers and automatic jacks. A phone rests in a cradle at pedestal base.

Detroit Dreams Up a Plastic Car with a Glass Roof

THIS dreamboat with a scarlet Fiberglas body and an all-glass roof even has a telephone! Less than 57 inches high, Ford's experimental XL-500 rides so close to the ground that the rear fenders had to be arched to make space for the wheels.

A bumper in two parts gives an unusual front appearance. At the rear, the main bumper protrudes from the body deck and vertical bumpers are set in each tail assembly. Narrow posts support the glareproof, heat-resistant roof.

Canister Flips Lid

THE lid automatically pops open when this canister is lifted from the shelf. It is manufactured in England by Newton, Shakespeare & Co. of Birmingham.

▶▶▶Two ham operators, Ross Bateman and William Smith, have bounced short-wave signals off the moon with amateur equipment. It has been done before—in 1946 by the Signal Corps—but with elaborate instruments.

RACING VERSION of Wildfire has souped-up Willys engine with triple-carburetor intake, special cam. For sporty looks without extra speed, there is stock-engine model.

New California Sports Job Made on Production Line

AN ANNUAL output of 250 cars a year wouldn't be much in Detroit, but it's a respectable start for an American-made sports car. That's the capacity of the plant in Downey, Calif., where B. R. Woodill is turning out his Wildfires. A plastic-bodied two-seater, the car sells for $3,263 and up.

Woodill uses Willys chassis, Willys or Mercury engines and other stock parts.

The frame and body are designed for equal weight distribution between front and rear. Transverse springs add strength for cornering. The car weighs 1,620 pounds, about half as much as a Ford or Chevvy.

Mixer Freezes Ice Cream

YOU can make old-fashioned ice cream now without using any old-fashioned elbow grease. The freezer above is an attachment for a Hobart KitchenAid electric mixer, which does the cranking job. Company also makes coffee-grinding attachment.

"TV Set" Teaches Blind Flying

WATCHING television gave Ray V. Bruland, Braniff Airways engineer, the idea for this pilot-training device. It provides a TV-like representation of the path of a plane (top part) being flown on instruments (bottom panel). Actually, it's all mechanical.

WATCHING THEIR "BABY," Dr. John Strong (seated) and Wilbur Perry check action of machine that can put 14,400 lines on a piece of glass with an accuracy of a millionth of an inch. It makes the diffraction gratings scientists use to analyze everything from stars to bloodstains.

These Men Do

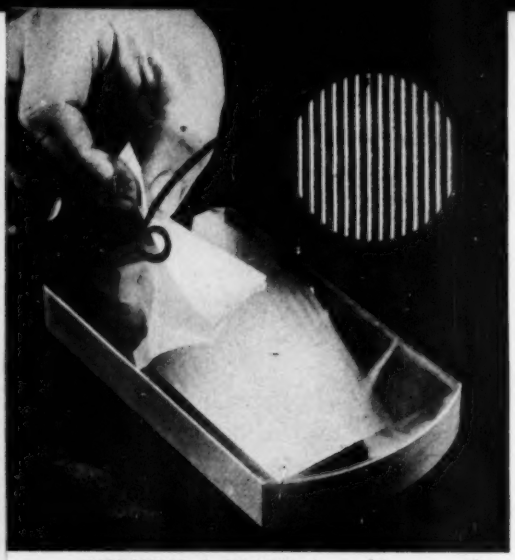
The World's Most Precise Machining

Millionth-inch accuracy is routine in making diffraction gratings, the finely ruled glass plates that reveal nature's innermost secrets.

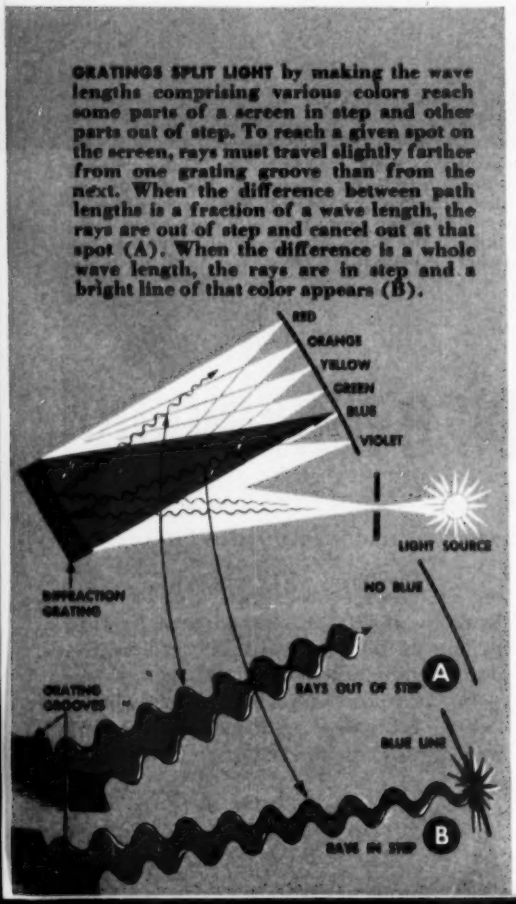
By Harry Walton

IN AN aluminum-lined vault under the physics lab at Johns Hopkins University a slight, soft-spoken Vermonter works at the most precise machining job on earth. All he does is rule parallel lines on aluminum-coated glass. But he puts as many as 30,000 lines to an inch. And he spaces them with absolute uniformity —to a millionth of an inch.

For 22 years Wilbur H. Perry has been ruling diffraction gratings, work that makes watchmaking look crude by com-



ENGRAVING A PINHEAD is nothing to ruling 14,400 lines per inch. Cigarette paper above is just .001 inch thick; the engine has to rule 15 lines in this width. Lines are embossed, not cut, in an extremely thin coating of aluminum on the glass. You can see diffraction colors by looking at a fine-grooved (long-playing) phonograph record at a low angle.



GRATINGS SPLIT LIGHT by making the wave lengths comprising various colors reach some parts of a screen in step and other parts out of step. To reach a given spot on the screen, rays must travel slightly farther from one grating groove than from the next. When the difference between path lengths is a fraction of a wave length, the rays are out of step and cancel out at that spot (A). When the difference is a whole wave length, the rays are in step and a bright line of that color appears (B).

parison. A momentary power failure, a speck of dust may ruin days of work.

Perry's raw materials are optical glass and aluminum. His tools are grinding and polishing equipment, high-vacuum chambers and pumps, diamonds, and fantastic mechanisms called ruling engines. His product is a slab of glass ⅞ inch thick, 3½ inches wide, 6 inches long. Price: $1,000.

Supply Can't Match Demand

Customers queue up to buy a Johns Hopkins diffraction grating. This does what a prism does—splits light up into its spectrum, spreading out the tell-tale lines of colors that fingerprint the substance emitting the light. But a grating does it better and costs less.

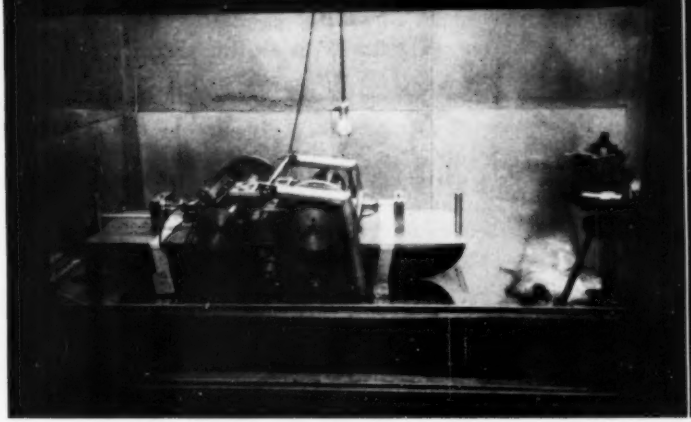
Diffraction gratings do their stuff in the spectrograph, which can spot arsenic in a raw carrot or a murder victim, tell the steelmaker when to tap his furnace, detect impurities in anything from motor oil to condensed milk, analyze the stuff in stars and identify a hit-run car beyond alibi. Research, industrial and police laboratories have many uses for the ruled plates. The trick is to make them.

A Dream and a Nightmare

What's so hard about ruling parallel lines, even 30,000 to the inch? You only need a machine that moves a pointed diamond across the aluminized-glass plate to rule one line, then lifts the diamond, advances the plate (or diamond) one line spacing, and repeats the whole cycle. This is a ruling engine.

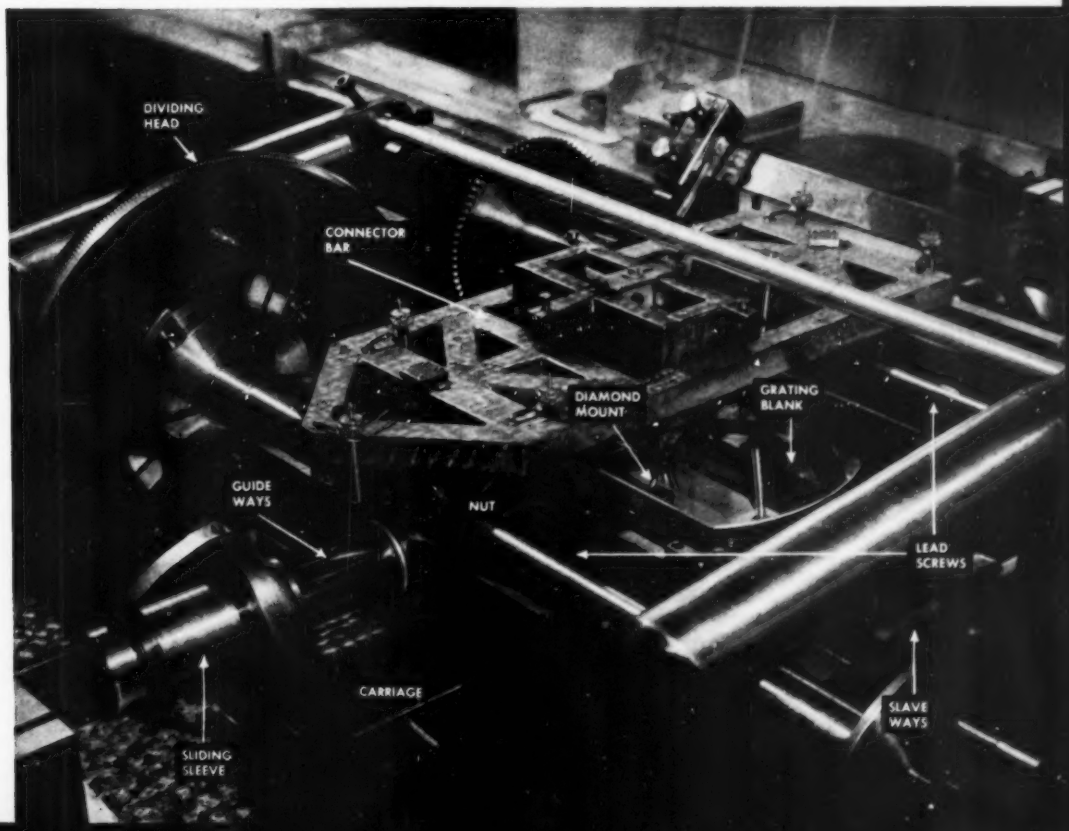
In practice, it comes into that "impossible" category which takes men of painstaking genius a little longer. One difficulty is that metal isn't rigid. When you work to a tolerance of one millionth, it's about as solid as a rubber hose. Your body throws off enough heat to expand one part more than another and throw the ruling diamond off course. Metal is neurotic, too. It "creeps," gradually changing form, and warps from stresses introduced by machining.

To rule one grating the machine may have to make 150,000 strokes. This adds



WATCHING THROUGH WINDOW is all the operator can do once ruling starts. The heat from his body would throw the whole works out of kilter—even the engine's drive motor is outside the vault for this same reason. Automatic controls maintain the temperature inside at 82°, varying no more than 1/10 of a degree. The thickness of the door—opened by Perry (right above) to take a grating blank in—indicates the amount of insulation used. The machine itself works entirely automatically, shutting itself off when finished.

NEWEST RULING ENGINE works like a machine-shop planer. The work moves under the diamond, which rests on the grating surface with a weight roughly equivalent to that of a coin. The long bar (upper right) lifts the diamond between strokes while the nuts, threaded onto lead screws, advance it one line spacing. Grating carriage shuttles back and forth on tapered sleeves sliding on cylindrical guides—exact centering of sleeve around guide being assured by the hydraulic pressure of the oil lubricating them.



up to wear, another ever-present pitfall.

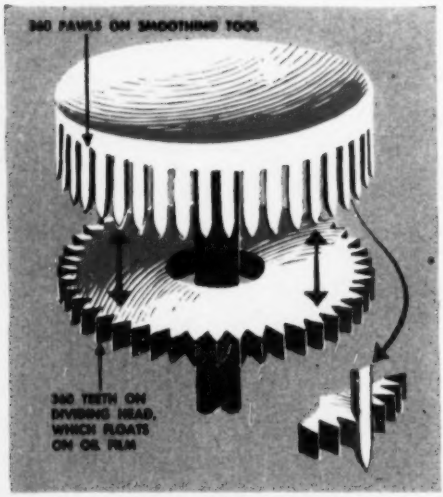
But the archenemy of the ruling engine is friction. You can't lick it with ample lubrication, because thick oil films may vary enough to alter line spacing. You have to use oil films scarcely more than a molecule thick. Such thin films break down here and there, making for a tremendous momentary increase in friction. When the surfaces "let go," the result in precision terms is about as subtle as the kick of a mule.

If the diamond vibrates (and it must be delicately mounted) the groove will be crooked. One invisible speck of dust, too, may throw off the ruling.

He Sweats It Out

Small wonder that Perry cleans and grooms the machine with finicky care. He always runs a ruling engine several hours before mounting a grating blank, both to smooth out the oil films and to let the friction-created temperature level out.

Once ruling starts, Perry doesn't go near the machine, but watches through a window in the side of the vault. "There's nothing to do then," he says, "but watch and pray."



SCREWS CONTROLLING LINE SPACING are driven by toothed wheel called a dividing head (above). To get each of its 360 teeth exactly alike—essential for uniform spacing by the lead screws—smoothing tool with 360 long, semi-flexible teeth was used. Tool was rotated one tooth at a time between strokes so that errors in dividing-head teeth and tool teeth averaged themselves out.

But though he sweats out the job from outside the vault, Perry has a special qualification for the work in hands that do not sweat. Moisture can corrode the aluminum coating on the gratings, so this is a real advantage. He is also sure-fingered, ambidextrous and possessed of a remarkably sensitive "feel."

Sandy-haired, spectacled, slight of build, Perry is an occupational pessimist. He expects nothing to go right of itself.

Perry now has a new engine, designed by Dr. John Strong of Johns Hopkins, that works much faster than the older types. It was built by Perry, Howard Head and John F. McLellan of the University, with a big assist from a former movie-projector repairman turned amateur telescope maker who had never even seen a ruling engine, Dave Broadhead of Wellsville, N. Y.

To Broadhead went what he calls "the screwy end" of the job: making the fantastically precise lead screws which, when turned slightly, advance the diamond exactly one line spacing. Broadhead completely overhauled the old South Bend lathe in his cellar shop, scraping the ways and refitting the parts, until it could hold a cut of 1/25,000 inch. Yet even such finicky turning can only rough out lead screws. They were finished by smoothing them with abrasive embedded in the threads of a long adjustable nut run up and down by an electric motor. This averaged out imperfections until they could be detected only optically.

It Worked the First Time

The engine was assembled at the University and adjusted by Perry. It ruled its first grating—14,400 lines per inch—in 56 hours, less than half the time taken by other types. That it worked the first time was considered something of a miracle by the men closest to it.

It didn't floor them long. The same team is now busy on a second engine to rule 28,800 grooves per inch. END

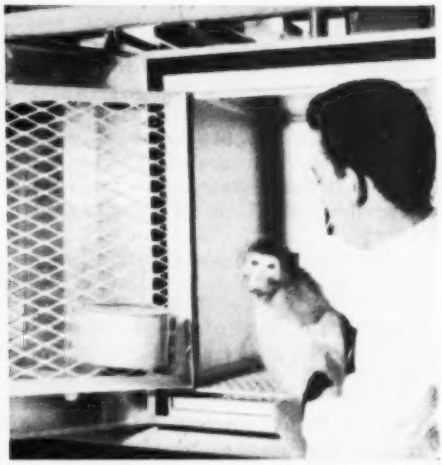
Egg Sorter Knows Colors

An egg is an egg is an egg, say government experts—there's no difference whether the shell is white or brown. Yet New York housewives pay more for white eggs, Boston cooks insist on brown.

Giving in to the housewives, the Department of Agriculture added two photocells to a sizing and candling machine (right). When a beam of light is thrown on the eggs, the dark shells reflect less blue light than the white ones. The cells pick up and measure the reflected light, then open gates to admit eggs into six different color compartments.

Phonograph Predicts Vibrations

This plastic model of a generator frame is being gone over with a crystal phonograph pickup while a device like a loudspeaker sets up vibrations. Westinghouse engineers use this method to find out what vibration will do to the real thing.



Monkey Cage Air-Conditioned

Monkeys breathe air delivered sterile to air-conditioned cages in a new laboratory. Exhaust air is sterilized again before it leaves the cages, to protect nearby animals. The monkeys are used in research on virus diseases by Parke, Davis.

Honeycombed Concrete Holds Heavy Loads, Cuts Like Wood

A BIG chunk of a new masonry material called Zeprex looks like any other block of concrete. But did you ever see a concrete block riding high, dry and handsome on the surface of a tank of water? Ever work concrete with ordinary carpenter's tools? Ever lay your hand—painlessly—on a 1½-inch concrete slab after a blowtorch has played on the other side for an hour?

You can do all these with Zeprex. As strong as regular concrete, it's one-fifth the weight; big slabs and blocks can be easily handled. It's such a good insulator that a six-inch slab blocks heat as well as a six-inch slab of concrete plus three inches of insulation board. That's why it has been used for houses up near the Arctic Circle and in the steaming heat of the Belgian Congo. It's strong enough so that a six-inch, load-bearing wall can be four stories high.

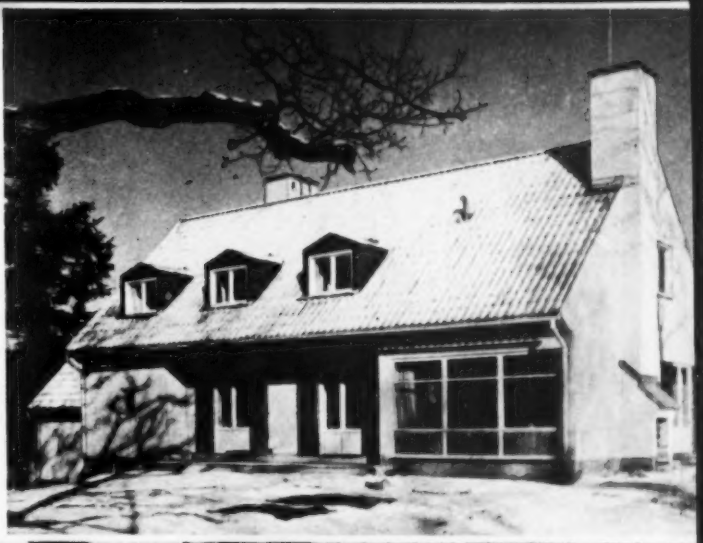
Add to these characteristics great resistance to water, stability and an attractive appearance. It's easy to see why U. S. Plywood is spending several million dollars to introduce Zeprex—the bright idea of a couple of Swedes—to this country.

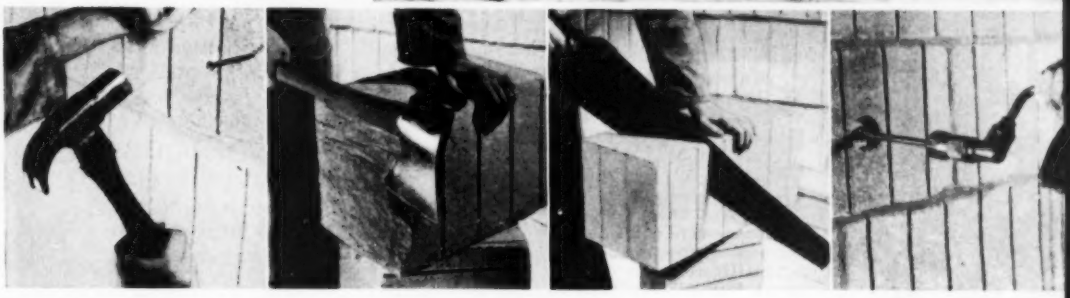
Take a broken piece of Zeprex in your hand and you can see its secret. Instead of having the solid, stonelike structure of ordinary concrete, it's like fossilized foam, honeycombed with tiny round air cells. These make it light, workable and a poor heat conductor. Its strength comes from the basic ingredient—monocalcium silicate, five times as strong as concrete. This is combined with sand, water and certain chemicals. The mix is expanded, or aerated, in big ovens much as bread is baked, with powdered aluminum for the "yeast." The whole process of making a cured slab takes 24 hours.

Zeprex is made in various sizes of blocks and slabs, and with various densities, according to the properties desired. The more air, the better insulation; the more concrete, the greater strength.

Zeprex units are used in building very much like other concrete, but because of its high insulating qualities a slab can form a whole wall without the need of added insulation. And because it works easily it is simple to fit conduits, bore holes, trim slabs, cut odd pieces, nail on furring strips. High-

LIGHTWEIGHT, big Zeprex roof slab can be lifted into place by two men, as shown at left. Low heat-conductivity of Zeprex makes it good insulator, so that in Swedish home at right, load-carrying Zeprex slabs also block cold. Floors and ceilings of house are also Zeprex slabs. Four pictures below show how material nails, cuts, saws, drills, like wood. "Sawdust" is a fine powder. Asked about costs, Swedish makers say one of their biggest orders has been for homes of workers in a factory making prefab wooden houses.





ly water-resistant, Zeprex walls can be left without any exterior finish, although they can be painted with concrete paint or stuccoed. Interiors can be painted or plastered right on the Zeprex.

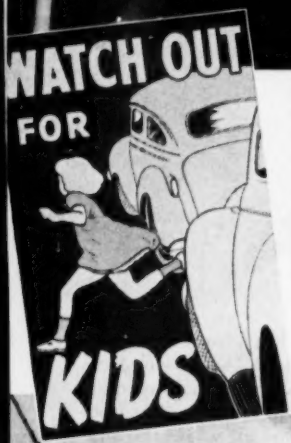
U. S. Plywood's first Zeprex plant will be in New York City, and sales at first will be limited to a 300-mile radius. Later plants will be built in other parts of the United States. Costs in this country are not yet completely worked out, but U. S. Plywood expects the slabs to sell for about half as much as a cast concrete slab with a glass-fiber insulating core. In Sweden, while the material itself costs more than the lumber that goes into a house, simplified construction is figured to make a Zeprex-slab home cost 15 to 20 percent less than a wooden one. END

When Is a Box a Bomb?

UNITED NATIONS officials are taking no chances on getting some screwball's bomb in the morning mail. The portable X-ray machine below will be used in a special guardhouse to give an inside view of suspicious packages, which will also be oil dunked.

Babies Can Nibble This Paint

THE newest thing in paints is good enough to eat—or at least curious babies can sample it without danger of lead poisoning. Called Speed Enamel, it's made by Sapolin without using any toxic ingredient. It dries to a hard gloss in four hours.



BLAZING COLORS from the Switzer palette make aircraft-carrier landing-signal officers (above) highly visible by day and, under black light, by night. These same fluorescent colors are now appearing in millions of posters at home (left) and abroad. They are especially popular in London (below) and other cloudy cities.

His Magic

Joe Switzer got a bright idea from Popular Science Monthly. Now scores of industries use his colors to brighten everything from thumbtacks to billboards.

By Wesley S. Griswold

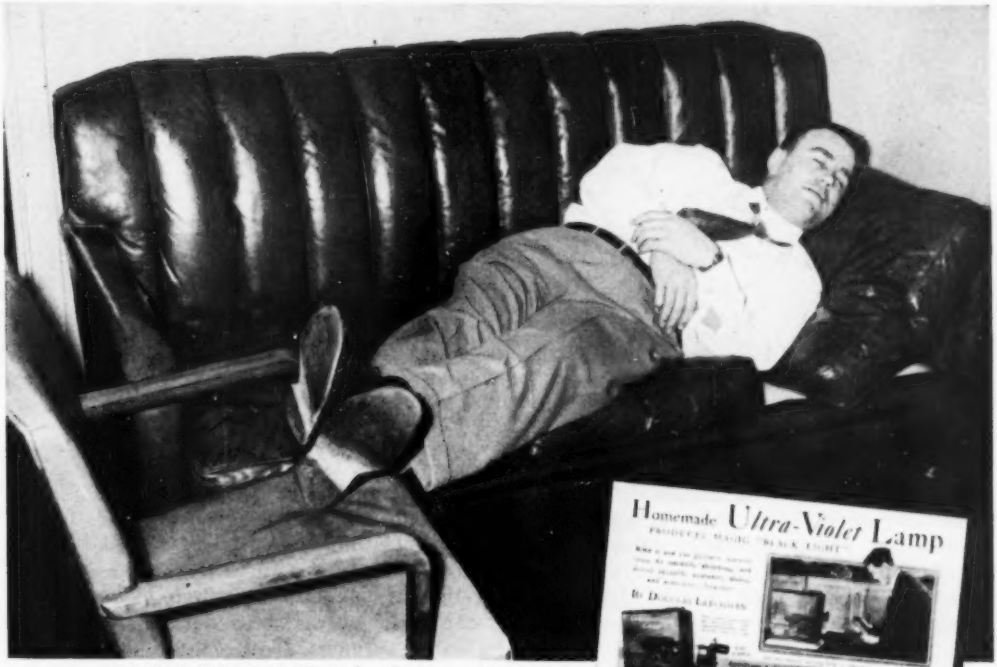
THE world hasn't looked the same since Joe Switzer, a 37-year-old chemist of Cleveland, started improving its colors. The new colors he has created, far brighter than any known before, make bathing suits and guided missiles visible for miles and golf balls and thumbtacks almost impossible to lose. Sunlit signboards in 34 countries sizzle with his hot reds, oranges, yellows and greens. Even in the cool light of dawn and dusk they seem to simmer.

Switzer's daylight-fluorescent colors, which reflect part of the sun's radiant energy that ordinary colors absorb, have done more to brighten drab spots than any invention since the electric light. You can hardly escape his handiwork. Hundreds of firms and the Army, Navy and Air Force are putting it to highly apparent use.

Colors Help Trace Rockets

Joe's blazing colors, which have brought him fame and fortune, have scores of uses. On fabrics they signal bombers flying as high as 12,000 feet over the battlefield and guide rescue parties to fliers grounded in the Arctic or drifting hopelessly in rubber boats on a vacant ocean. On buoys they lead landing craft safely through mine fields. They have made hunting jackets, caps, shirts, socks, shoelaces, gowns, umbrellas, wrapping papers, beach balls, piggy banks and toy tops glow like neon signs. They have climbed miles into the upper air on the

Makes the World Glow



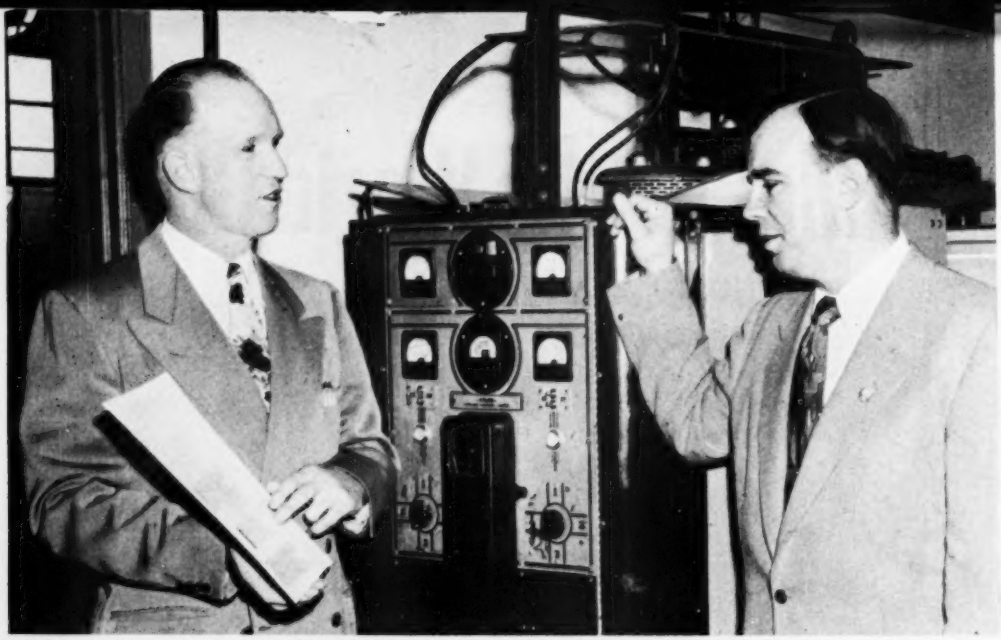
Homemade Ultra-Violet Lamp

AN EXHAUSTED INVENTOR, Joe Switzer, takes a badly needed nap at his Cleveland lab. He says the 1932 POPULAR SCIENCE article at right launched him on his spectacular career.

noses of rockets, and afterwards helped search planes locate recording instruments strewn across proving-ground sands. Now they are beginning to find their way onto magazine pages.

Chemists had known about black-light fluorescence for almost a hundred years before Joe Switzer came along, but no one had thought of making a big business of it. Starting with no knowledge of chemistry and very little money, Joe has picked up a lot of both in 20 busy years. He and his older brother, Bob, now hold scores of patents and patent applications on ways to create fluorescence and use it commercially. They license at least 4,000 firms at home and abroad. From these licenses comes a steady flow of royalties to Switzer Brothers, Inc., the company that Joe and Bob founded eight years ago.

Joe Switzer got his start on a stool at the soda fountain in his father's drugstore in Berkeley, Calif. Joe, then a high-school kid of 17 with a flair for perform-



SAMPLING the outdoors indoors, Bob Switzer (left) and his younger brother, Joe, examine daubs of their daylight-fluorescent colors that have just emerged from the weatherometer behind them. This machine duplicates the effects of sunlight and moisture in the open.

ing magic, was reading the December, 1932, issue of POPULAR SCIENCE MONTHLY, just out. The magazine contained an article entitled "Homemade Ultra-Violet Lamp Produces Magic 'Black Light.'" It gave Joe an idea.

Act Wows Classmates

Browsing through his father's store that night with a hastily improvised black light, Joe found several drugs that glowed in the lamp's invisible rays, just as the article had said. Mixing these in shellac, he set to work painting props.

The result was the most awesome magic act his school friends had ever seen. Its climax came in a darkened auditorium. A glowing sword, apparently in nobody's hands, slithered across the stage and sliced off the head of a Balinese dancing girl, leaving it suspended in mid-air. The torso then gaily pranced off into the wings, bleeding fluorescently from its severed neck.

Joe's renown spread fast as a result of this spectacle, but it took his older brother, Bob, to capitalize on it.

"Let's bottle this stuff and sell it by mail," Bob suggested.

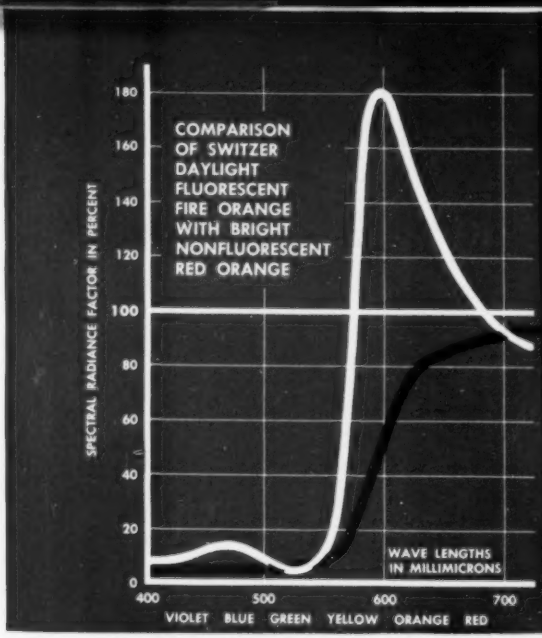
The boys borrowed their mother's kitchen mixer and set up shop in the garage. Business at first was slow, but one day Bob landed a fat commission—decorating a new San Francisco night spot. The club opened in a weird glow from walls, costumes, floral centerpieces, souvenir hats and even tablecloths. The Switzers' fame began to spread.

It produced a request from a Cincinnati firm to create a black-light fluorescent ink for marking laundry. This offer, though the boys were still minors and couldn't sign a contract, put them both firmly on the road to the big time.

After developing an invisible laundry ink, Joe produced an invisible powder that helps police trap criminals lined up under near-ultraviolet lamps.

Joe's black-light fluorescent paints, lacquers and varnishes were used to decorate everything from Sally Rand's G-strings to large expanses of the Golden Gate Exposition and the New York World's Fair. They appeared on night-club and theater walls, on the skirts of chorus girls.

Success didn't come in a rush, however. When the Switzers moved to



BRIGHTER THAN BRIGHT, a Switzer daylight-fluorescent color, as this graph shows, far outshines its brightest nonfluorescent rival.

KERNELS OF COLOR, the fluorescent dye particles at right above are ground to fine powder (left) before being made into paints, inks.

Cleveland, they were employees of another company, and they paid their first assistant, a chemist named Richard A. Ward, out of their own meager salaries. Their laboratory was in a rented apartment that had one extra room. Joe and his wife and first baby lived in one half of the room, Ward in the other, with a blanket hung between.

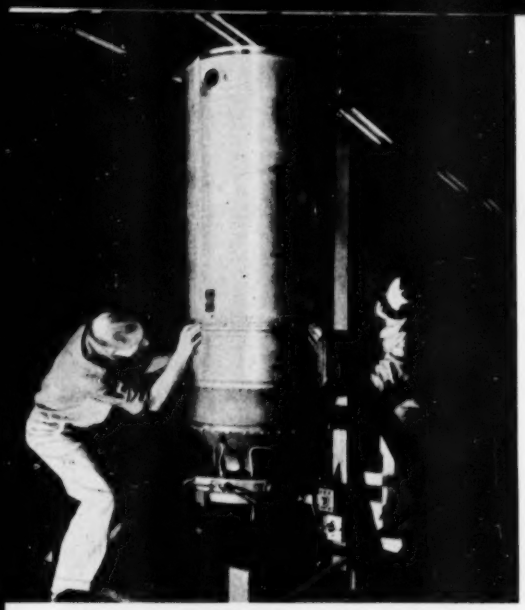
It was then that Joe and Dick Ward developed a black-light fluorescent ink for lithographing theater posters and billboards. This product, during World War II, made possible the mass production of fluorescent maps, charts, dials, navigation tables and bombing manuals, which came vividly to life under black light in the darkness of battle areas.

Bob Switzer, too, became an inventor. Utilizing black-light fluorescent materials, he developed the Zyglo and Magnaglo processes, which are used to detect minute flaws in metal products.

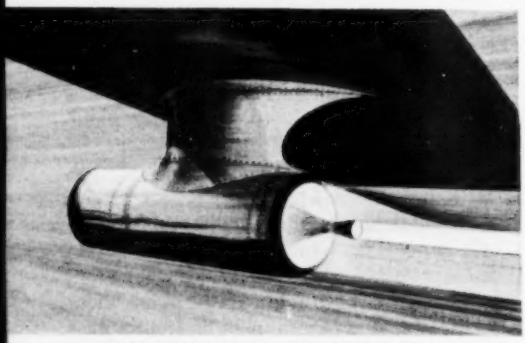
In the course of experiments prior to the war that began in 1939, Joe Switzer created by organic chemistry the superbrilliant colors that have put Nature's

[*Continued on page 238*]

JOE SWITZER'S MERRY TROUPE, lined up for a Christmas-card photo, are talented enough to stage shows. The five boys, however, share a dim view of fluorescence.



SHEET-METAL COWL is lowered over the Firebee's J-44, six-foot, 300-pound turbojet engine, claimed to be the most powerful of its size developed in this country.



OTHER USES for the Fairchild J-44 engine include underwing mounting to give added jet boost to commercial planes, as shown above, and as a power plant for helicopters.

RELEASED from the belly of its B-26 mother plane, the pilotless Firebee streaks out over a New Mexico desert. As the remote-control pilot push-buttons it to near-sonic speed, fast piloted jet fighter planes will be on its trail, spitting rockets and bullets. At right the Firebee mid-wing, swept-back drone target plane is shown on the ground being readied for flight.

Plug-In Jets Zoom Targets Across Sky

THE Firebee, powered by America's first small jet engine, flies at speeds close to that of sound and at high altitudes. About half the size of our jet fighters doing combat in Korea, it can do aerial acrobatics that would gray the hair of pilots in the cockpits of its bigger brothers.

Its job is to be shot at from the air and from the ground to train our gunners in sonic-age marksmanship.

Sounds like a dangerous plane to fly, and it would be if it carried a pilot. But the Ryan Firebee (or Q-2) is a target drone—a nolo (no live operator) aircraft. It is flown

electronically by remote control from a little black box located either on the ground or in a mother plane in the air. By means of radar it can be maneuvered out of sight of the remote-controller. When it runs out of fuel or is damaged by gunfire, a two-stage parachute system lowers the little jet safely to the ground.

Weighing about 1,800 pounds, the 18-foot Q-2 has a wing span of 12 feet. It also has been used to train operators in radar tracking of high-speed targets.

A significant feature of the Firebee is its engine, the Fairchild J-44, which gives 1,000 pounds of thrust for 300 pounds of weight. The low cost of the engine makes it expendable for use in warfare. Thus, the role of the target drone could easily, by adding bombs or rockets, be changed to a remote-controlled, pilotless jet combat plane.

The J-44 comes up with a new trick in jet-engine design. A sheet-metal cowl that encircles its six-foot length is not only the pressure chamber, but provides a rigidity that eliminates the need for a heavy skeleton of frames and housings. In fact, the engine is so rigid that if used to power a guided missile it could be plugged into the tail.

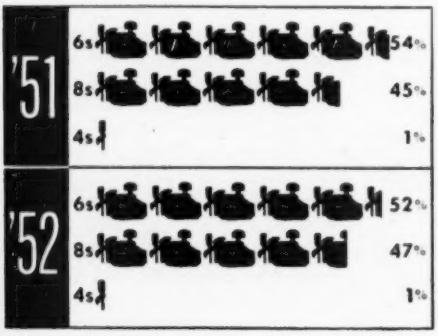
P.S

Last minute news & notes...

USABLE ENERGY FROM SUNLIGHT, a cherished dream of science, has been realized on a small scale by two researchers at MIT. The sunlight causes two reactions working simultaneously in opposite directions to change cerium ions back and forth from one electrical state to another. The result of the reactions is the decomposition of water into hydrogen and oxygen, which can be burned to provide much energy. The method promises to be economical because the materials are not used, merely being changed back and forth; the energy obtained comes from the sun.

A TIME COMPRESSOR invented at the University of Illinois shortens speech or music as much as 50 percent without changing tone or intelligibility. Using a tape recording, it chops the sound into sections, discards unneeded parts and squeezes the rest close together. . . Radio-controlled street lights are proposed for New York City. Small receivers mounted on the light posts and triggered by a signal from the city's radio station would replace mechanical clock-switches.

THE EIGHTS ARE SURE TO WIN the automobile-engine popularity contest this year, predicts the trade paper "Automotive News." Sixes have been losing favor in recent years (see chart), while V-8s have been gaining the fastest.



THE INDIANAPOLIS 500-MILE RACE may include a stock engine this Memorial Day for the first time in many years. A Chrysler V-8 in a Kurtis-Kraft chassis has been entered by Lou Belanger (PSM, Jan. '53, p. 171). Souped to 215 horsepower, the engine will have its stroke shortened to reduce the displacement to 270 cubic inches, as required by AAA rules. . . Cold Alaska has so much warm water (from volcanic springs) that 17 new Jeep fire engines being sent there for civil-defense duty are equipped with special "heat exchangers." They'll cool the water sprayed on fires--cold water puts out fires faster.

WATER CONSUMPTION RATES TV SHOWS in Toledo. City officials say that low demand means people are glued to their sets--"I Love Lucy" dropped it 13.8 percent below normal. Every quarter hour or so consumption jumps sharply--that's the commercial.

CHEAPER HOME AIR CONDITIONING is foreseen in a trade-association report. Tests last summer in an experimental house indicated: unexpectedly small cooling units will do the job; ordinary ducts installed for warm-air heating are okay for cooling, too...The peas can't burn on a new Westinghouse electric stove --a thermostat built into the burner shuts off the juice if the pot boils dry...New plastic wallpaper paste that dries very slowly lets you slide the paper around on the wall to get a perfect match. It also mixes easily without forming annoying lumps and won't stain even dark-colored paper.

A COMBINED AIRPORT, SALT MINE AND COOLING PLANT is in sight for Detroit. There's $1,000,000 worth of salt under Detroit-Wayne Major Airport. If a proposed mining deal goes through, cool air from the shafts will be piped up to air-condition buildings at the airport.

The Editors

We Built a Swimming Pool for $300

Substituting sweat for money, we lined and edged our concrete pool in just 118 man-hours.

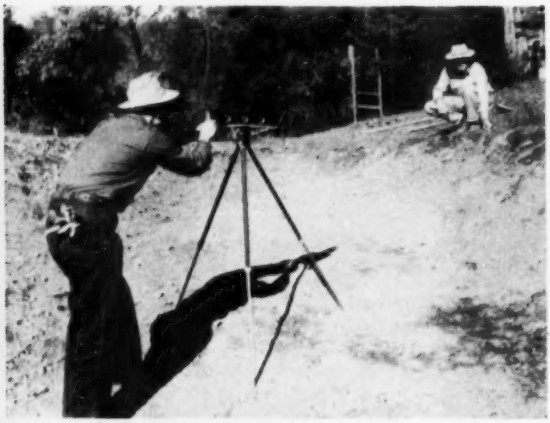
By Paul Corey and Darrell Huff

AFTER mumbling about it for years we have just—quite suddenly—built ourselves a swimming pool. We did every lick of the work ourselves, we and the neighbors, and it didn't turn out to be half the job we'd figured.

What was just a rough hole-in-the-ground

GRAB A PICK AND SHOVEL

1 DOING IT THE HARD WAY, authors dug the swimming-pool hole with sweat and shovels. Another time, they say, they'd let a tractor or 'dozer help, even though it would run up cost. Above, Corey has shovel; Huff, pick.



2 HOMEMADE TRANSIT—a level on a plywood base, mounted on a camera tripod—was used to find level line for pool rim. Line was marked by stakes driven in every 10 or 15 feet. No hired labor was used on the project.

nine days ago, is today a finished pool. It's full of clear, inviting water and about half full of people.

Our pool is no midget. It's bigger than many of the professionally built jobs. It is 53′ long, 23′ wide at its widest, and it holds 20,000 gallons. Since diving was not contemplated, its greatest depth of just under 6′ is adequate.

Is ours a perfectly smooth, neat and professional job of pool building? Nope.

Did it cost the usual $3,000 to $5,000? Nope. More like $300.

Will we get just as much fun out of it as if it were professional and expensive? You bet.

Can anyone who has a backyard build himself one as good as ours? We don't see why not.

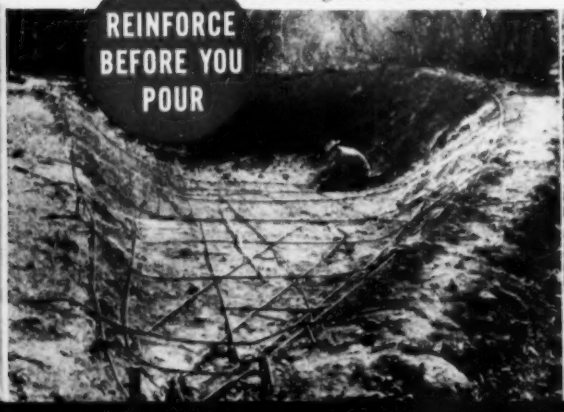
Before we started, we spent several days and covered a thousand miles looking into pool building. This is, in addition to being a report on our own job, a summary of what we discovered.

We learn about pools. One thing we were told is that pools are going great guns these days. About 7,000 private pools are being built each year, compared with about 200 in 1940. We also learned, however, that it would take more dollars than either of us cared to put into it if we wanted to have one built for us. Typical price for an attractive 17-by-34-footer is $3,000 around Los Angeles, $4,500 in Oregon, around $6,000 in the East.

These prices include a filter system and assorted accessories and equipment that our $300 one does not have. These are fine pools and would, we think, make a bigger

3 TO REINFORCE CONCRETE, welded-wire mesh was placed over whole area, plus ⅜″ steel rods about two feet apart. Extra rods were used where downhill-side bank was highest and weakest.

REINFORCE BEFORE YOU POUR



4 FOR DRAINAGE, every part of pool should slope toward outlet. Authors used 1½″ pipe and ordinary shower head instead of $12.50 swimming-pool drain. Remove strainer during concreting and close pipe opening.

impression on the neighbors than one like ours. And, being better finished, they are undoubtedly easier to maintain. But, we said to ourselves, you're either in the Cadillac-and-Jag class or you ain't. We ain't. So . . .

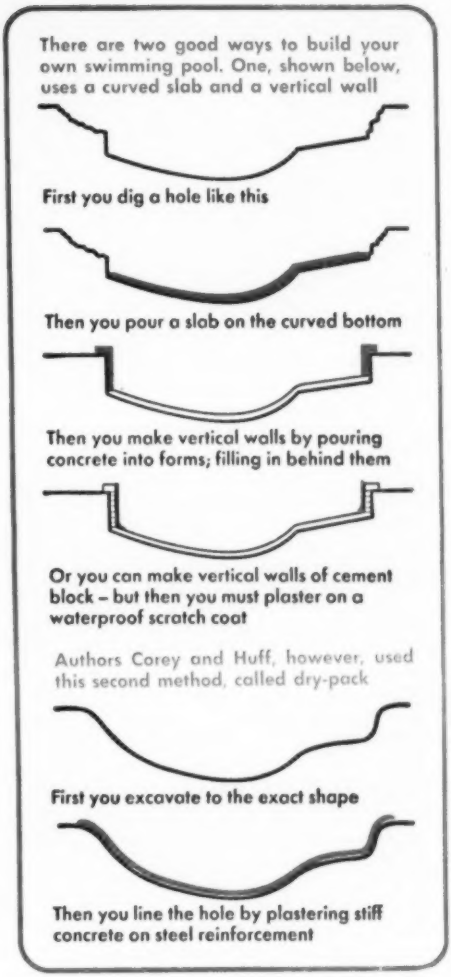
Choice of two methods. For the man who wants to build his own swimming pool there are two excellent methods. The method we used is called dry-pack. You dig a spoon-shaped depression in the ground and then line it with stiff concrete. The other begins with pouring a curved bottom below ground level. Then you put vertical walls on that. Because of the straight walls it is more feasible to get enough depth for high diving this way. But it does involve more work and more money.

Getting started. One of the swimming-pool companies has worked out three sets of blueprints for amateurs to use. One covers a poured-wall pool, one a block-wall, and a third covers a Gunite pool (concrete that is blown into place by air pressure). They offer the set, along with information on accessories and equipment, for $1.* If you'd like to build a pool of any of those three types, by all means get those blueprints. If you elect to dry-pack, as we did, get them anyway. The methods have a good deal in common.

Now let us give you the low-down on how we built our pool.

Digging a hole. The first job is by all odds the simplest—and the most tiresome. It consists of digging a hole. We did every lick of this by pick and shovel; that's why there's no excavating item in our cost budget. This is fine if you can spread the job

Landon, Inc., 5920 Sepulveda Blvd., Van Nuys, Calif.



5 TWISTS OF BALING WIRE held mesh and rods together. Reinforcement averaged a pound of steel per square foot of area. After concrete had been partly spread, two extra rows of reinforcing rod were added.

6 ROCKS keep reinforcement off floor of pool, where builders feared trampling would force steel down to bottom of concrete. Reinforcement should be roughly centered in concrete to resist pressures from both sides.

over several months, putting in a few hours at a time once or twice a week.

If you're in a hurry or value your time, hire a bulldozer. (Make sure first, though, that the 'dozer can get to the site.) You'll get plenty of exercise cleaning up the hole and the area around it when the machine gets through.

Because our site was on a fairly steep slope, we dug out the hillside and piled up the dirt in a long bank to form the lower side of the pool. It is simpler to work on level ground, and this avoids putting concrete against fill, which is not as solid as original ground.

Shaping the pool. For the shape of our pool we just went along with nature. We dug without any preliminary plan, conforming to the lay of the land and continuing until we liked what we had. This gave us a long teardrop shape somewhat flattened on the upper side. We made it just under 6′ deep at the deepest portion and sloped it up from there just enough to drain properly until we were two-thirds of the way to the narrow end. From there it rises more sharply, giving a depth of about a foot at the shallow end.

Our pool is not deep enough for diving. If you want a diving board, make your pool at least 8′ to 10′ deep at one end.

As we dug we made the banks as smooth as we could, which was not very smooth because of boulders and roots.

Putting in the pipe. The drain is the first piece of plumbing to think about and the only one that is absolutely essential. It goes, naturally, at the lowest point of the excavation. Our hillside permitted a gravity drain. We'll use that until we can put in a filter system that will make draining the pool unnecessary.

With the future filter in mind, we also stubbed a short length of ¾″ water pipe through the wall so that it would be flush with the surface of the concrete. This will be the return from the filter system.

There's no need to provide a fresh-water intake before building the pool. To meet plumbing codes, the filler pipe should come over the top of the pool edge, so it can be installed any time.

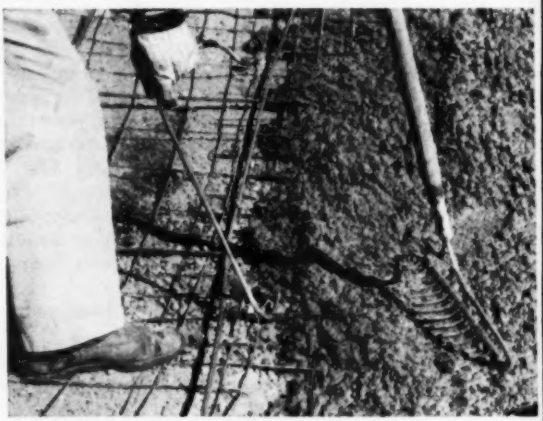
Mixing concrete. Many people who build pools use transit-mixed concrete instead of doing their own mixing. Doing so can cut your concreting labor by half or more, so transit-mix is probably well worth the cost. Before adopting this method, however, make sure you can get the kind of mix you need and get it at the right times and in the right amounts.

Make sure, too, that it is going to be possible for these heavy trucks to get close enough to the pool site. This was not possible in our location, so we mixed our own. We saved about $60 by doing the job ourselves, or perhaps $2 for each extra hour spent.

We used a small mixer with a ½-hp. electric motor. Aggregate around our parts comes with sand and gravel already mixed, so we simply had 20 yards of it dumped

CONCRETE COMES NEXT

7 UNPAID HELP—daughter, guest, father-in-law, neighbor—made up crew of two mixers, one barrow-man, one spreader. Tubs of cement and water were kept by mixer; six cups waterproofing added to each water tub.



10 PULLING UP THE REINFORCEMENT helps to center it in the concrete as the mix is spread. Tool is a reinforcing rod, bent into a hook at one end, handle at the other. Rake was used to tamp as well as spread concrete.

8 EACH BARROW-LOAD of concrete was dumped off rim; then raked up, down, or sideways to where needed. Photo shows proper stiffness of mix—plastic but dry enough to stay in place. Good mixing was vital.

9 MAN IN THE HOLE had the hardest job—raking the concrete to uniform thickness—and needed that campstool for a breather between loads. Concrete in background has already been packed with the back of a shovel.

11 PACKING THE CONCRETE was done by whacking it with shovel back. This both compacts mix and partly smooths surface. Authors added fifth man to crew when possible so one could lunch without halting mix.

12 THE MORE YOU WHACK, the smoother and sounder concrete will be. By the time it is stiff enough for compacting—an hour or so—it can be walked on without harm. Authors wish they'd whacked more, gotten better finish.

as near to the mixer as possible. This gave us enough for the pool and walkway and a couple of yards left over for other landscaping as we get to it.

General formula for dry-pack concrete is 1 part cement to 2½ of sand and 3½ of gravel, with as little water as possible. One man we know made a pool having steep sides only 15° off vertical. He used a richer, finer mix so it would stick: 1 cement, to 2 sand, to 3 pea gravel.

One concession we made to the problem of getting the stuff to stick in place was using Novamix.* It is specially recommended for producing a more plastic and watertight concrete for such jobs as no-form swimming pools.

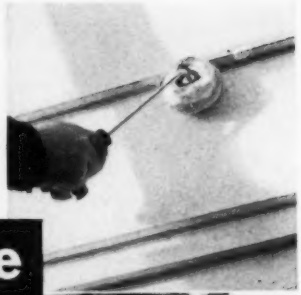
After you have mixed two or three loads you'll have learned how much water to use. Aim at having just enough to permit thorough mixing. The mix must be dry enough to stay in place against the sides of the pool. Run the mixer a little longer than usually is necessary—at least three minutes for each batch.

We rounded up all the part-time help we could for the two days of the big pour: one father-in-law, one unfortunate house guest, two neighbors. A teen-age daughter handled the water and Novamix most of the

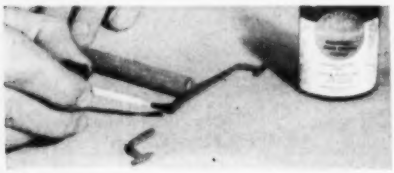
*Nova Sales Co., Trenton 3, N. J.

[Continued on page 246]

New for the Handy Man

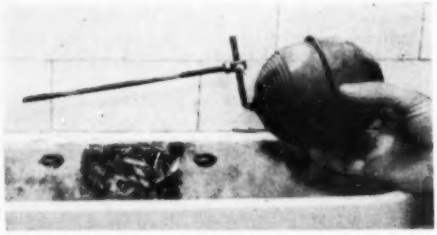


1. Roller Set Speeds House Painting. You can now roller-paint the outside of your house as easily as the inside. The covered tray-bucket lets you mix the paint in it and carry it up the ladder like a pail (right). Then the tray is turned flat and fastened to a rung of the ladder by an adjustable bracket. After large areas have been covered with the long roller (above), a small, doughnut-shaped roller is used to get under the edges of lap joints (upper right), in corners and under eaves. The rollers can be used on all types of exterior surfaces—shingle, clapboard, stucco and concrete block—and for indoor painting with oil or water paints.



2. Welds Plastic in 10 Seconds. Broken plastic toys and household articles can be quickly mended with this plastic welding agent. You brush it on both parts (left), press them firmly together for 10 seconds and the resulting bond is as strong as the plastic itself. It's also useful for hobbyists who assemble plastic models.

3. Steel for Small Jobs. Nearly any piece of steel stock needed for small machining, building and repair jobs is right at hand when you need it with this kit of 12 assorted sizes. The pack contains rounds from 3/16″ to ½″, squares of ¼″ and ½″, flats from ⅛″ by 3/16″ to ¼″ by ½″, and tubing from ¼″ to 1⅜″ outside diameter. It comes in two lengths of stock, 12″ and 36″.



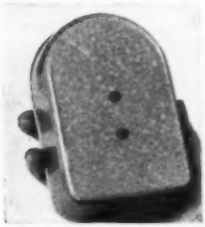
4. Float Level Adjusts Quickly. Those toilet floats that are always needing readjustment can be quickly set to the proper level with this adapter rod. The L-shaped rod and collar connect between the float and the arm, permitting the float to be raised or lowered without having to bend the arm. The adapter is also said to stop overflow noise and save water.

5. Panels Glue on Wall. No nails, furring strips or seam coverings are needed when you put up these gypsum wall panels. You just spread on a special adhesive (right) and glue them in place. The ⅜″ panels are 16″ wide, come in 8′, 9′ and 10′ lengths and can be put up over any old wall or over a wallboard backing on new walls. Faced with paper, they are available with a plain, striated or knotty-pine finish (left) and can be painted or wallpapered.

6. Sprinkler Hose Sprays Anywhere. You can snake this plastic spray hose through flower beds, around corners and into hard-to-reach spots to put water anywhere you want it. Tiny holes along its 25′ length spray out water in a 10′ swath. Connections at both ends permit attaching it to a regular hose or hooking several together for large coverage.

8. Slip-Proof Gloves Save Hands. These plastic-coated work gloves have a tough, crinkly surface that gives you a sure grip on smooth, slippery materials and protects hands from cuts and abrasion. The coating resists oils, grease, acids and alkalis.

7. Battery Powers Fire Alarm. You can place this tiny fire alarm anywhere in the house and it will sound a loud warning if the temperature reaches 140°. Powered by dry cells, it is simply hung on a nail. Several units can be wired together so that all will ring if one is triggered.



9. Plastic Vents Air Paint. House paint is less likely to peel if the walls are ventilated by these plastic breathers. The vents are small louvered cylinders that fit into ¾″ holes bored in the wall. The louvers keep out rain, but let in air, drying up moisture that causes peeling.

Further information on these products can be obtained from: 1. E-Z-Paintr Corp., 4051 S. Iowa Ave., Milwaukee 22; 2. Postamatic Co., 1549 Belfield Ave., Philadelphia 41; 3. Solar Steel Corp., Union Commerce Bldg., Cleveland; 4. Richcraft Products, Box 448, Scranton, Pa.; 5. U. S. Gypsum Co., 300 W. Adams Clark St., Chicago; 6. Gates Rubber Co., 999 S. Broadway, Denver, Colo.; 7. Alarms, Inc., 91 Cambridge St., Boston 14; 8. Plasticote Glove Co., 102 E. Walnut St., Milwaukee 12; 9. Vent-O-Wall Co., 16201 Elsienna Ave., Cleveland.

Hitch Your Boat to an Air Prop

Driven by small airplane engines, these puddle skimmers can hit real speed on little more than a heavy dew.

By Harry Walton

ACROSS the grassy skyline moves a growing dot. Its distant hum resolves into the flat bark of an unmuffled engine. The dot takes shape as a fast-moving airboat that banks steeply and slews in toward shore.

Idling in toward the landing, the craft resembles a scow, mismatched with the hot end of a Cub. Rudder and throttle controls are as rough and ready as the steering rig on a kid's coaster. "I could build one of these things," you think as you step aboard, "and still have enough left out of a vacation to have the fun of running it."

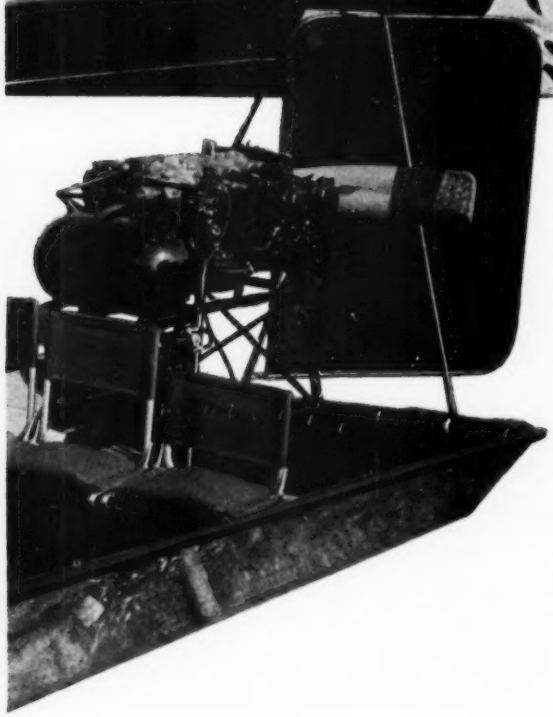
As you take one of the seats amidships, the engine catches again. It nudges the boat through the water hyacinths. Once free, the odd little craft begins to lay back its ears.

The pilot heads for a grassy bank and guns the engine to a full-throated roar. You brace yourself for a shock that never comes. The boat slides onto the grass (growing in an inch or so of water) and skims on even faster, perhaps because the grass lifts it slightly, decreasing hull resistance. Airboat men claim they can hit 60 this way.

Slewing around a turn, you lose the landing behind patches of scrub growth. The scenery goes by at 40 m.p.h. How would a boat like this feel, you wonder, on your own lake or bay?

Scow hulls like this skim over inch-deep water and grass in the Everglades. With higher sides, a similar hull would serve on lakes or lagoons. The bottom may be of marine plywood or sheet metal. Pusher-type prop is mounted behind the engine. High pilot's seat enables him to see over tall grass. Where he can sit low, rudder stick could be replaced by wheel.

Fan-powered boats are exciting. For speed thrills and sport on the water nothing beats a shallow-draft hull driven by a light aircraft engine and an air propeller.



It handles differently from one with a water prop and rudder. Control cables run from the air rudder through sheaves to a stick hinged to the deck before the pilot, who sits high to see over tall grass. He throws the rudder over for a fast turn and the boat heels, throwing spray from under the high side, sliding crabwise for a moment until the pilot puts the helm the other way and blows the tail around.

Airboats Have Fast Pickup

The airboat responds to the throttle nicely, slowing as the pilot swings around a stump, picking up fast in a stretch, darting effortlessly through a twisty channel. It's a smooth, speedy ride.

Nobody knows who first put an air prop on a hull, but sportsmen are discovering that these small airboats are the ticket to new thrills. They are far cheaper to build and operate than the big 200-hp. airboats of past years. Since they have no underwater prop and rudder to foul, they'll go in

shallows that would hardly wet your instep. You can forget about eelgrass, mud flats, shear pins and a clogged cooling system. Yet with suitable hulls, airboats can outride the weather on salt water or on your favorite lake.

Along the Gulf Coast, they help fishermen and hunters cram more fun into short hours. You can get into an airboat and have a couple of hours of sport before nightfall.

You'd expect to pay a high price for such a fast package of transportation. But with careful shopping, ingenuity and a little work, you can build an airboat for about $200.

Shop Airports for Used Engines

Engines from light planes, no longer airworthy but still good for many hours of running, can sometimes be picked up for as little as 50 bucks. A 75-hp. Continental will give seven or eight miles per gallon and speeds close to 60 m.p.h. So, if you're airboat-minded, better shop the local airfields as well as the swap-and-sell columns of fliers' magazines.

Look for an old Continental or Lycoming that's due for a major overhaul, or orphaned by windstorm damage to its plane, or taken out of a ship unlicensable because of bad fabric. It should rev up above 2,000 r.p.m. and not lose too much oil.

Some engines have electric starters, and if you want this advantage, you'll need the complete generator-battery system that goes with it. You'll be able to use lights and an electric fuel pump with such a rig too. A self-starter is a big advantage if the airboat is a family proposition. Your wife or youngster can run it, but you wouldn't want them dodging a hand-started propeller. On the other hand, prop flipping needn't be risky if you do it right.

Gravity fuel feed from a small tank above the carburetor dispenses with fuel pump. The owner of this Everglades boat, Hilton Moland, takes fishing parties and sight-seers into Loxahatchee National Wildlife Refuge near Delray Beach, Fla.

Deep-hulled airboats like this sportsman's craft can take rough water. Some have a water rudder coupled to the air vane for better steering at low speeds.

Your sailing waters will decide the type of hull to build. In the Florida Everglades, boats have no rough water to fight. A typical airboat there has a 5½′ beam and is 14′ long. The sides are no more than 18″ deep, sometimes less. But a hull like that won't take rough water. For that you'll want more freeboard and perhaps a sharp bow rather than a scow-type.

Gulf Boats Are Larger

A popular open-water boat used in Gulf regions has a 6′ beam, is 16′ long, 19″ deep at the transom and 24″ amidships, where it has a 2″ step. The hull is flat at the step and flat or veed fore and aft of it. Such a boat will draw less than 3″ of water. Frames can be built up of 1″ by 4″ oak, glued, bolted and reinforced with plywood gussets. Spaced 30″ apart, the frames are assembled on a 1″ by 6″ keelson with an oak stem.

Plywood is easier to put on than planking, light, strong and reasonable in cost. Usually the bottom is put on first, with marine glue and muslin in all joints and brass woodscrews as fastenings. Sides are

put on and bent around simultaneously, a little at a time, to avoid warping the hull out of symmetry.

A pair of one-by-two oak stringers, screwed to the frames through the 2″ dimension, will protect the bottom and also prevent skidding at high speed.

Scow-type hulls are of course even simpler. Some 'Glades builders make frames of cypress and cover them with sheet aluminum. Seams can be welded, soldered with some of the slick new alloys available or covered with Celastic, a plastic fabric used to repair auto bodies.

Stubby props especially made for ice sleds and airboats are preferable, since they let you place the engine lower and keep down the center of gravity. Although both tractor (pulling) and pusher props are used, the latter have the advantage of being farther from passengers. They also enable the engine to be a bit farther forward without sacrificing extra space, and may enable you to dispense with a guard—but a guard is always a good idea.

You may be able to pick up a used prop at an airport or from a mail-order house, or order one from a manufacturer. It's not advisable to try to cut down a small plane prop yourself.

The motor mount must be husky and well-braced forward. It may be of welded steel tubing or ½″ angle, securely bolted to the hull frames. Better have your prop in hand before installing engine mounts, since it will affect engine location and height. Line up the prop shaft with the keelson or centerline of the hull both lengthwise and hori-

Even outboards are sprouting air props these days. This experimental job is being tested by Kiekhaefer Corporation, makers of Mercury outboards. Called the Airboard, it clamps on transom, swings for steering, and may be made in 9- to 85-hp. sizes. Research was triggered by company's work in two-cycle engines and fast-turning small props for target planes. Uses may include driving boats on ice or in ice-jammed waters as well as in swamps, and crop dusting or preventing frost in orchards.

zontally. Several trials under power may be necessary to get the thrust line right.

You can dispense with the carburetor heat that prevents icing in plane operation. You may also want to mount a gas tank above carburetor level, letting gravity do the job. However, this raises the center of gravity a mite more and isn't as safe fire-wise as a hull tank and fuel-pump feed.

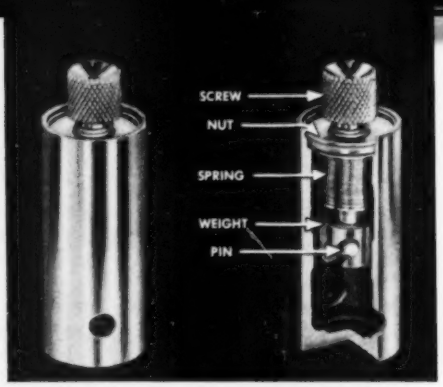
If on trial you find you have to give rudder to go straight at cruising speed, you can angle the motor mount a trifle to compensate. If the prop thrust is too much downward, the boat may tend to climb out of the water at the stern, pushing the bow down. Too much upthrust, on the other hand, may push the bottom down, reducing speed. Adjust engine position with washers under the mounting bolts.

A prop guard is a must if you use a tractor prop, or with any prop in crowded waters. Wire mesh on a sturdy frame of steel angle or tubing makes a safe guard. It's a good idea to paint the prop tips bright red.

Pointers on Handling

If you're an old powerboat hand you'll have to learn some new tricks. You'll always want to come in to a dock upwind if possible—there's no reverse on an airboat and you lose rudder response at low speeds, although you can bat the tail around with a blast of prop wash. With an adequate rudder, you may be able to turn almost in a boat's length, but at what speed this is safe will depend on its beam, passenger placement, wind and the weather.

Bear in mind that aircraft-motor life and overhaul periods are stretched by running at less than full throttle. A few hundred r.p.m. can make quite a difference in this respect. If your engine has to wind up over 2,100 r.p.m. to give you a reasonable boat speed, a prop of greater pitch may be indicated. END



Tappets Adjust Their Length

MECHANICAL tappets automatically adjust to variations in the length of the valve-actuating system when an engine heats up or cools off or when wear occurs. The tappets can be used in any engine.

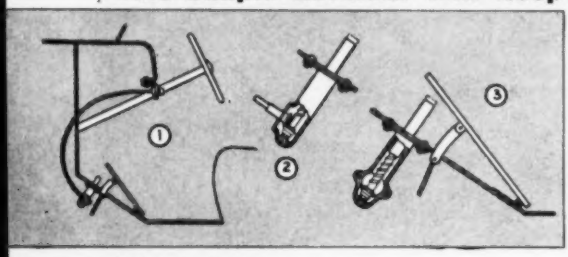
Each time the cam lobe raises and drops the unit, a free-floating weight moves up and down inside, a pin and curved slot imparting a back and forth twisting motion to the weight. This twist carries through to the screw, turning it and automatically lengthening or shortening the tappet assembly to adjust to any changes in the valve-actuating system. *Skinner-Moser Sales, Dunedin, Fla.*

Engine Sandblasts Its Plugs

USING a new cleaning unit, you can sandblast carbon from your spark plugs without moving your car away from home.

After screwing the aluminum unit into a spark-plug hole, you pour a little sand into its top, screw a dirty plug into the unit, and then run the engine for a few seconds, allowing compression to sandblast the carbon. Inside the cleaner are three fine-mesh brass screens which the manufacturer says will keep all sand out of the cylinder. *Sharon Manufacturing Co., 1685 N. Milwaukee Ave., Chicago.*

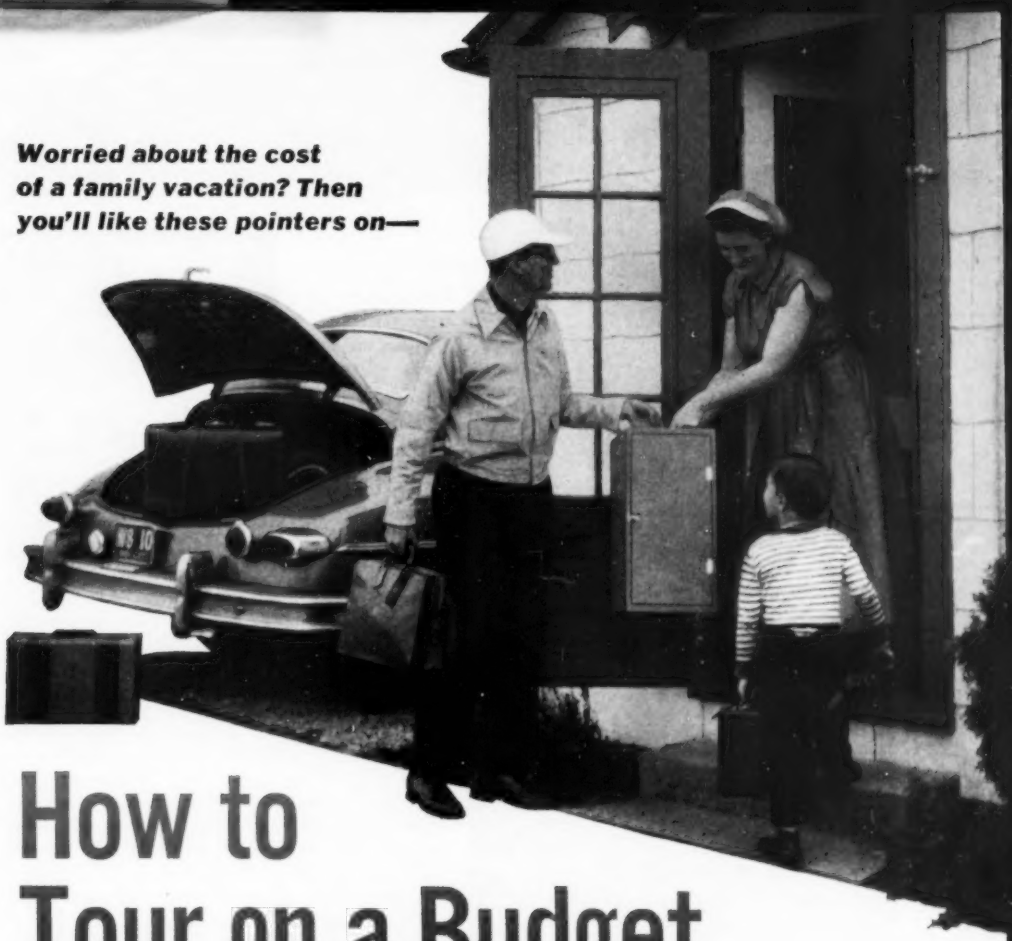
This Simple Governor Will Keep Junior to a Safe Speed



POP can restrict Junior to a safe speed with a new adjustable governor that prevents the accelerator from being depressed beyond a fixed point.

A key inserted in the dash control (1) turns a flexible cable. A gear on the cable end (2) turns the governor arm up or down by means of a screw (3). Once the arm has been set, it can be changed only with the key. *Dortal Co., Saginaw, Mich.*

Worried about the cost of a family vacation? Then you'll like these pointers on—



How to Tour on a Budget

By R. P. Stevenson

THIS year, more than ever, it will pay you to count your dough before you jump into the family bus for a vacation trip. On-the-road expenses have gone up as much as the cost of living at home. Some states have slapped on new taxes, too.

But you *can* do something about it. You can lop a bit off each of the three major touring expenses—your eats, a place to sleep and the cost of operating the car. The amount you save will depend mostly on how hard you work at it before and during the trip. In these days, however, your economies, even though small, could easily determine whether you can afford the trip.

Take a breakfast kit. Satisfying vacation-sharpened appetites three times daily in restaurants strains any pocketbook. But you and your family can eat and drink well along the way, and still be merry, at a lesser cost. Getting your own breakfast will help. You can do this by taking along a simple kit that is easily and economically assembled.

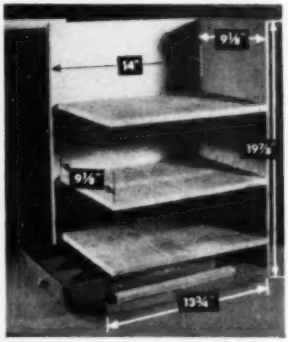
An electric hot plate, packed into the kit, will enable you to make coffee—and even have a hot breakfast if desired. Include a screw-base plug to turn into a light socket in case the overnight motel doesn't have a wall receptacle. With a few utensils in the kit and food supplies bought the night before, you can have the same breakfast you have at home.

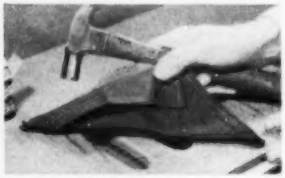
And you need not confine your home cooking to breakfast, either. By carrying a luggage-compartment icebox, homemade or commercial, you can plan for and have a picnic lunch along the road. A gasoline

Breakfast kit like this takes no more space in the car than a suitcase and is as easy to carry. It includes a one-burner electric hot plate, skillet, saucepan, tray of silverware, and enough plates and cups for three or four persons. Dish towels pack everything snug.

Eating is a major travel cost. Here is one way you can keep it down.

Dimensions of box should be suited to the items you plan to carry, but the figures at right may serve as a guide. No need to waste time on fancy construction. Here, one side, top and door of breakfast kit still are to go in place.



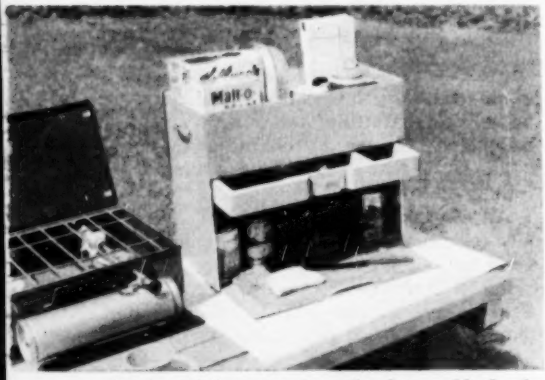


Two slots in the top serve as a carrying handle. Rectangle of cloth tacked on underside keeps out dirt. Allow slack for finger room. Paint or varnish the exterior of the finished kit box. Plastic dishes are the best for traveling.

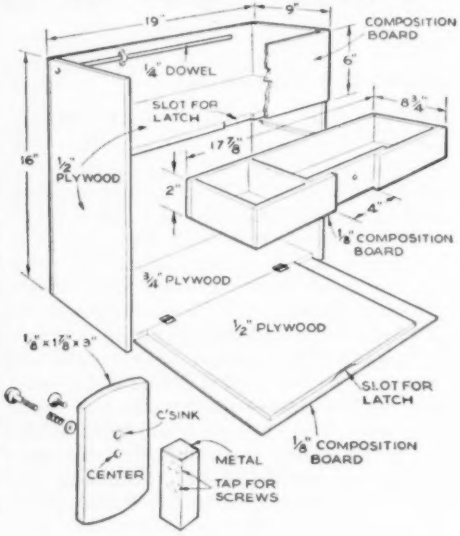
camp stove will extend the range of luncheon possibilities.

Persons who have traveled this way, going only to a restaurant for the evening meal, have found it satisfies every appetite at a considerable saving in money. One motorist who took a transcontinental round trip last summer estimated that the plan saved him a minimum of $25 a week in the cost of food that he, his wife, and

You can have a hearty meal in the open air if you take along this equipment.



Designed for camping, this kit could also be used for preparing meals while you are on the road. Pivoting latch on the drawer slips into slots and locks both the drawer and the door. Dowel slides out through end to serve as dish-towel rack. Plywood on door makes a good breadboard. A gasoline camp stove will put you into the meal business anywhere.



child consumed. If you travel with young children, preparing your own breakfast and noonday meal often will also be more convenient and satisfactory.

How to sleep for less. Traveling in a conventional car, there isn't much you can do about keeping down the cost of overnight accommodations except to stop early enough each day so you can pick the less expensive places. That way you won't be forced, through lack of vacancies, to take something that hits your pocketbook hard.

But you can arrange to sleep in your car without too much difficulty. This has the drawback, of course, that in industrial and populous areas you may find it difficult to locate a safe and convenient spot to pull off the road. In the open stretches, however, sleeping in the car is wholly practicable. Taking along a tent and camping equipment, especially if you already own them, will also bring you home with a fatter bank account when you travel through regions that offer camping sites.

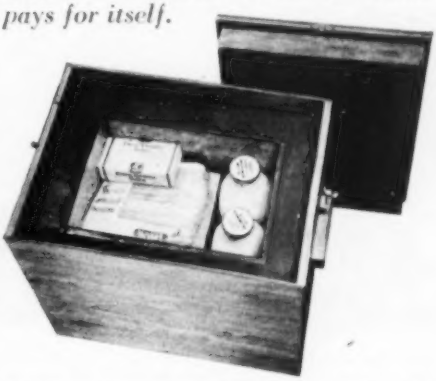
Putting a bed in your car should offer no trouble and it often can be done at practically no cost, although the sleeping accommodations are limited to two persons.

Passenger cars usually are converted to bedrooms in one of two ways. The most common consists of arranging the front-seat back rests to fold back, filling the space between the front- and rear-seat cushions. A wooden platform is needed to keep the back rests level with the cushions. Late-model, two-door Ford sedans are well suited to this treatment. Each back can be detached by removing the cotter pin from the pivot and pulling toward the outside of the car to slip the seat pins out of the bracket holes. When the three cushions are level, a couple of blankets and a pillow put you to bed.

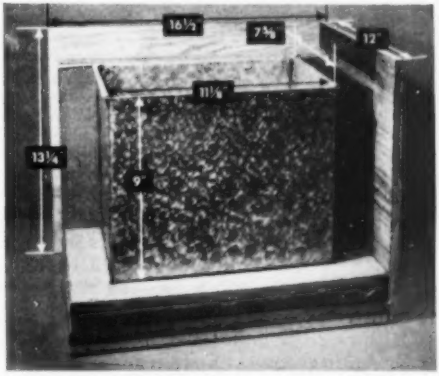
The second common conversion method consists of removing the rear-seat back rest and the cardboard or fiber trunk partition. You then can install a wooden platform, leveling it to suit the particular car, put in a mattress, and sleep with your feet in the trunk. The front seats are not disturbed.

In still a third method, you would also remove the rear seat and leave it at home. As shown in the accompanying photos, you

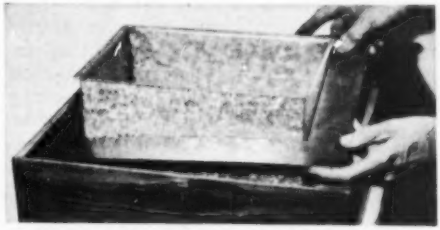
A homemade icebox in the car trunk pays for itself.



Luggage-compartment icebox is easy to make if you prefer not to buy one. This one is big enough for two quarts of milk, a pound each of butter and bacon and a few vegetables. A 5" by 7" by 7" metal box (under the bacon) holds ice. Lid (in background) presses into place.

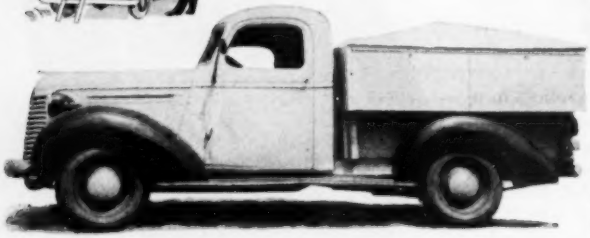


Liner is rectangular box made of galvanized sheet, joints being soldered to make them watertight. Three ½" sheets of insulation, salvaged from old refrigerator, were placed on all sides. Insulation must be dry.



Sheet-metal frame covers insulation and lip of liner fits down over it, a sealing compound producing a watertight joint. Attach insulating sheets to lid with water-resistant glue. Screw handles to the end of wood box.

You can eat and sleep just about anywhere if you go in a converted pickup.



A camp on wheels, this pickup truck has been used twice by Mr. and Mrs. John Bell, Provincetown, Mass., for coast-to-coast trips. When truck is ready for road as above, sheet of plastic covers tent and sleeping bags.

Box structure consists of 2" by 3" posts bolted to truck body, 1" by 2" side- and crossbeams and ¾" plywood panels inside and out. Luggage goes into truck body, as does collapsible ladder to reach sleeping quarters. Ladder is made of furring bolted together.

Tent is supported atop box by V-frames and a bridging ridgepole. Materials, hardware and tent cost $47.30. The outfit saved the Bells this much in less than a week on the road. Tent measures 6' by 7'.

Side compartments, made by extending structure beyond truck body, hold stove, utensils, water jug and food. Compartment doors hinge down, making handy tables 20" wide for preparing meals, eating.

then would carry a mattress for a folding bed, remove the front seats each night, and place the mattress on its leveling platform. A canvas or plastic cover protects the front seats during the night outside.

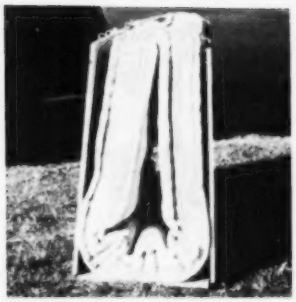
Reducing car expenses. The final realm of travel expenditures where you can save money is the cost of operating your car. Here, the main goal is saving gasoline. Two factors determine how much fuel you use—the mechanical condition of the car and your personal driving habits.

It goes without saying that you should make certain the car is prepared mechanically before you set out. For the highest economy, leaner carburetor jets or setting would be in order. Spark plugs should be gapped and the ignition timing set according to maker's specifications.

On the road a light foot on the gas pedal, accelerating slowly instead of trying for fast starts, coasting in slowly to stop lights to avoid full stops, upshifting at the slowest possible speeds to keep down gas-consuming engine revs, using the choke sparingly (if hand-operated), and keeping to moderate speeds will all contribute a bit to more miles per gallon.

How fast to travel? Vacationing motorists are of two types—those who want to get somewhere fast, wasting as little time as possible on the road, and those who may be going nowhere in particular, enjoying the travel for its own sake. The first type, speeding at 60-plus miles per hour, will save no gasoline. The others can turn the trip into a personal economy run, have fun checking their gas mileage over a period of days, and enjoy the scenery and points of interest that speeders see only as a blur.

You may remember that during the war a national speed limit of 35 miles per hour was in effect as a gasoline-conservation measure. Tests have shown that 30 to 35 miles per hour still remains the most economical speed. If the speeders on the parkways and major highways give signs of finding you a nuisance at that limit, get off on the blue-line routes if you can. Those routes are more fun anyway. END



For touring, a 48"-wide inner-spring mattress folds up in its base, a 4′ by 6′ panel of ½" plywood cut into three pieces and hinged together. Middle piece is 17" wide.

For sleeping, mattress folds down on its base after front seat is removed. George L. Henderson, Toluca, Ill., says this is best of four different car-sleeping arrangements he has used.

A bed in your car will save you an average of $5 a night. By setting the front seat outside, you can stretch out in real comfort on a folding-bed mattress.

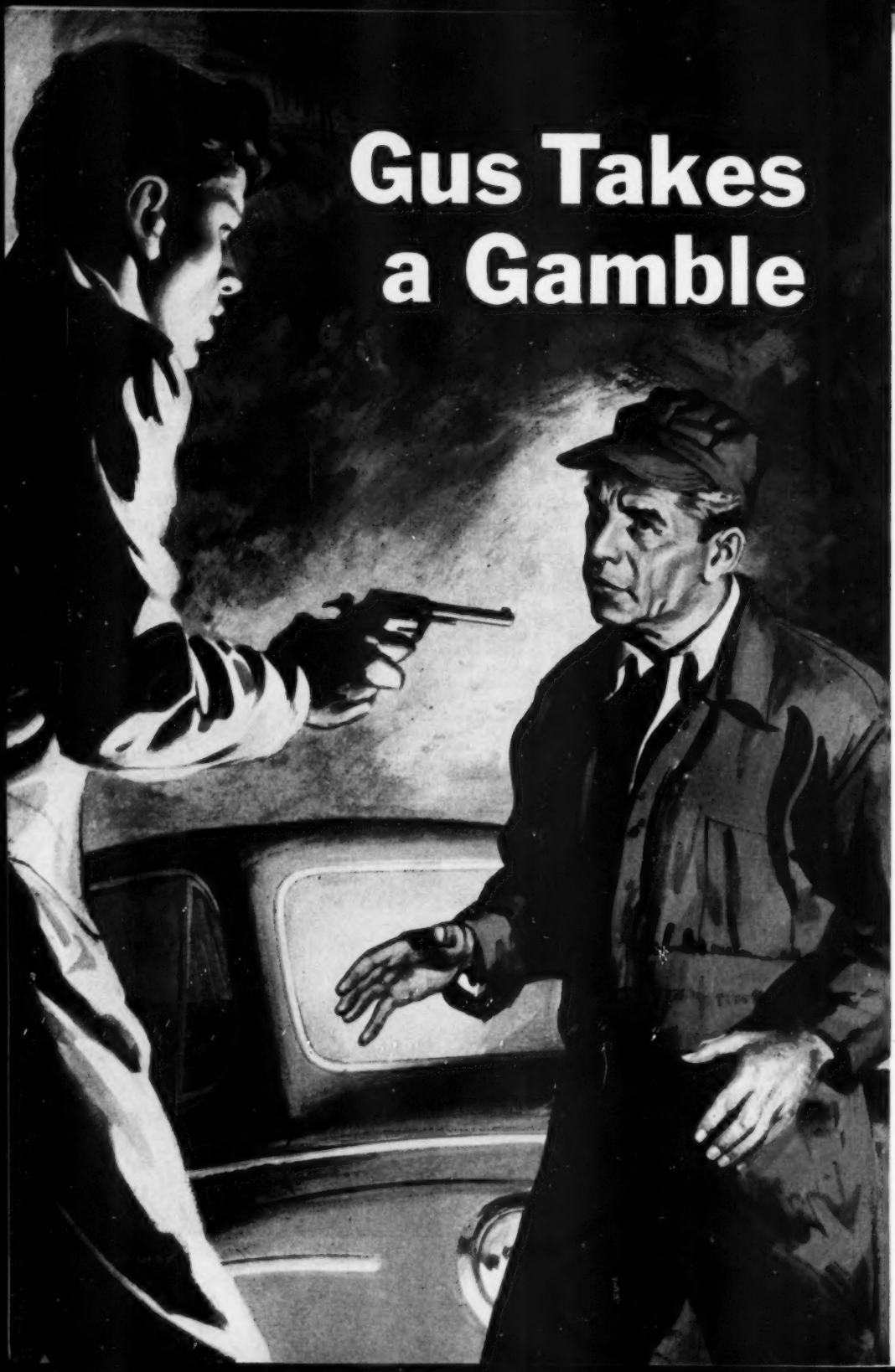
Rear seat is left at home and bed is carried in its place. Mattress is type made for folding bed. The unit sits low enough in car to leave road visible in rear-view mirror.

Front seat goes out during the night and is covered with a tarpaulin. In car shown, seat is removed by loosening eight bolts. Cost of bed was less than $30, most of it for mattress.

If you expect to camp along the way, this metal frame will keep the coffee pot out of the fire.

Easily made, the pot platform at right takes little space in the car trunk when folded flat. It consists of a discarded wire oven shelf bolted to one leaf of a strap hinge, the other leaf of which is welded or clamped to a ⅜" rod. As seen here, the rod can be driven into the ground to support the frame above the fire. The wishbone brace has an eye at the top that slips over the rod and is stopped by a nut welded just below the top of the rod. Both lower ends of the brace are bent around the outside of the shelf.

Gus Takes a Gamble



Tracing that engine trouble was a tough job even for Gus—and a kibitzing kid with a pistol didn't make it any easier.

By Martin Bunn

THE kid came after sundown and stood in the shadows just inside the Model Garage. He was much too young for the grim look around his eyes and mouth. It reminded you of the concrete jungles of the city, but he was a local boy—Gus had seen him around—and the violent trembling of the gun in his hand shattered the illusion of toughness.

"Don't argue, mister. You're Gus Wilson, and you're going to fix my car quick. I ain't got anything against you personally, but get busy or you may get hurt."

"Suppose a customer comes in. Got that figured out too?"

"Close the door and use your trouble light."

Gus rolled down the door and snapped on the small caged light. It cast a glow on the kid's sweat-shined face. He couldn't be more than 17.

"And you expect me to work on this car with that gun twitching in your hand?"

The kid looked down at the gun, then shoved it in his pocket.

"Okay, but don't get any ideas. I could shoot you before you took two steps."

"All right, suppose you tell me what's wrong with the car."

"She misses, especially when you step on the gas all of a sudden, like when you're getting away from a light. Sometimes she runs perfect. Had her up to 75 easy just last night."

Gus Recalls Rainstorm

That stopped Gus. "You were driving 75 miles an hour in that downpour?" He recalled the heavy rainstorm that had kept him home all evening.

"Sure, why not?" the kid said with a touch of bravado. "I can handle her in a skid."

"Uh-huh," said Gus. He lifted the hood, reached down and removed the distributor cap. The rotor, points and condenser seemed to be all right.

"What are you running away from?" He didn't expect an answer, but talking might calm the boy a little.

"You'll read it in the paper tomorrow, I guess. Dill's Feed Store is missing 700 bucks. I worked for old man Dill up to tonight. Sure, front page and pictures, so there's no harm in telling you. Johnny Wentz missing, cash register robbed. But by the time the cops find out, I'll be too far away . . . and you're coming with me."

"Where do you figure is 'too far away' for the police?"

"Get to work and cut the gab!"

Gus said nothing. He cleaned and gapped the V-8's plugs, and put them back. When he started the engine it idled fast and a little rough, stalling when he set the idling-speed adjustment down a bit. Gus backed out the idling-mixture screws slightly and restarted the engine. The idle seemed better but she still bucked a little when he pulled open the throttle rod.

Kid Tells Why He Took the Money

"Why did you do it? Old man Dill paid you a salary."

"Chicken feed! Look, I've been on my own since I was 12. I never had anything of my own until I saved up for this car and these duds I got on. And I've been living in a cheap boardinghouse. I want better clothes and a decent place to live!"

"And you think stealing is going to make that dream come true? Tell me, how are you going to enjoy these things when you're constantly on the run?"

Johnny pointed to the engine, but Gus knew his words had cut deep.

Gus looked over the carburetor for anything that would plug the air or fuel supply or cause it to be temporarily cut off during the surge of acceleration.

The carburetor was clean enough, and Gus moved down a mental check list to the next suspect, the fuel pump. While he dis-

"I've had enough of this nonsense, kid," Gus said.

mantled the pump, he was aware of the kid fidgeting with growing impatience.

"What's taking so long?"

Gus ignored the question and looked at the pump mechanism. The intake and outlet valves were not gummed up with fuel deposits or tank additives. And the diaphragm edges weren't worn enough to cause trouble.

"Can't find anything wrong," he finally answered.

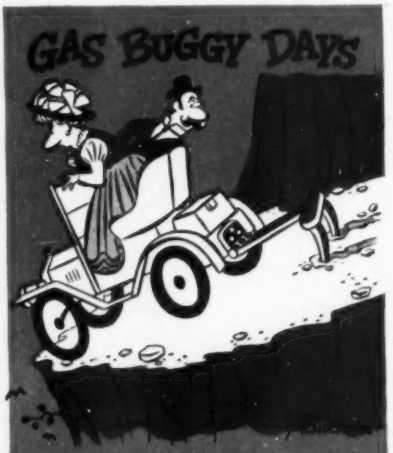
"Look, Wilson—" the kid's eyes narrowed, "you're just stalling!"

The gun was out again, and the kid's hand was no steadier than before.

"That pistol won't speed things up, sonny, I can only work so fast."

Gus tried to get his mind off the boy and concentrate on the car. He began looking for high-voltage leaks, tracing the plug leads again, looking for bare wires, loose connections, corrosion. He followed the line leading from the coil to the distributor. Then he examined the ignition connections in back of the dash. By now, he was satisfied that the trouble was in the carburetion system. Something was starving the engine.

He crawled under the car with the trouble light and traced the fuel line from tank to engine. The leak he suspected was not there, and blowing the line failed to show any obstruction. He turned to the kid.



When the auto was in its infancy, a popular safety feature was the drop brake or "sprag"—a pair of iron spikes hinged to the rear axle which could be released to dig into the ground if the regular brakes failed. This was known as "letting the sprag drag."

Gus Defies the Kid's Gun

"Okay, pull that trigger if you're going to, because I've gone as far as I can." Gus began walking deliberately toward him.

Johnny Wentz stepped back, and the gun he held wobbled in the dim light.

"Stay back . . ."

"No, Johnny. I've had enough of this nonsense. You're not going to shoot, because you just aren't the type."

Gus covered the last three feet in one quick step and deftly removed the pistol from the boy's hand. Johnny Wentz stared unbelievingly at Gus for a moment, and then broke into a fit of sobbing. Gus led the boy to the car and made him sit down.

"Start driving," Gus said firmly. "You're going to put that money back."

The boy moved the car into the street. The engine did skip a little, Gus noted professionally, as they pulled away. He pocketed the gun—no need for that any more.

"Suppose they catch me before I get a chance to turn myself in," the kid was saying. "It's always better to turn yourself in—I know that much. I guess you think I'm nothing but a stupid little punk. But you know, I was glad when you took the gun. I was scared to death."

"So was I," Gus said wryly, as Johnny pulled up in front of Dill's without cutting the ignition. "I'll wait here. You're on your own, Johnny."

"You're going to trust me? I could run out on you."

"I don't think you will."

The boy walked slowly around to the back. Gus hoped he was doing the right thing. It was a gamble. The rain had started up again. To keep busy while he waited, Gus began tinkering with the windshield wiper. He had a peculiar notion . . .

A few minutes later, the boy came back.

"A cop was looking around back in the alley. I had to wait until he wasn't looking to crawl through the back window. The money's in the register."

"Okay. Drive me back to the garage, and then you go on home."

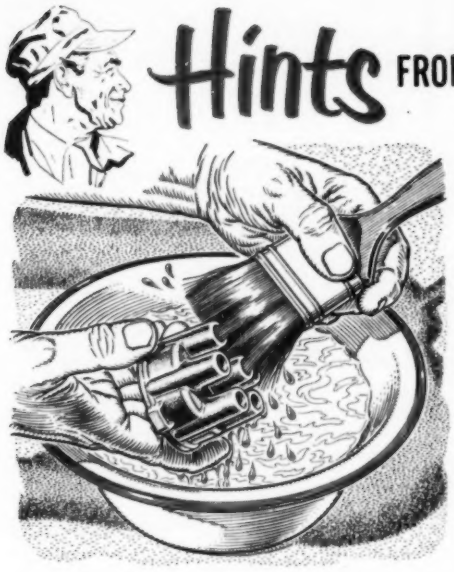
"What? I thought— Look, I'm a—"

"Come on," said Gus, "let's go."

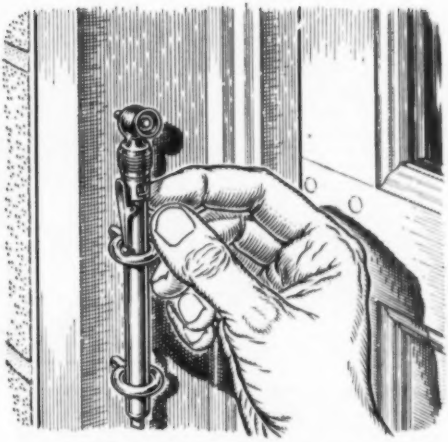
The kid wasn't a particularly good driver during those few blocks back to the garage. Gus covered the painful interlude by telling

[*Continued on page 242*]

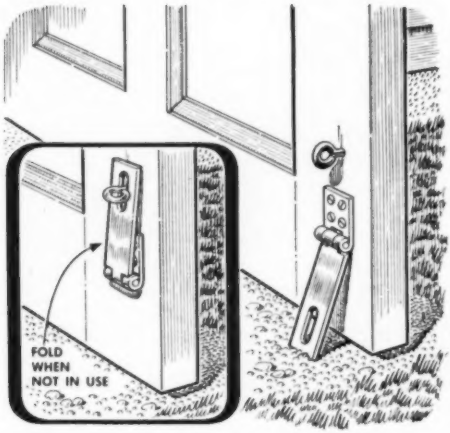
Hints FROM THE MODEL GARAGE



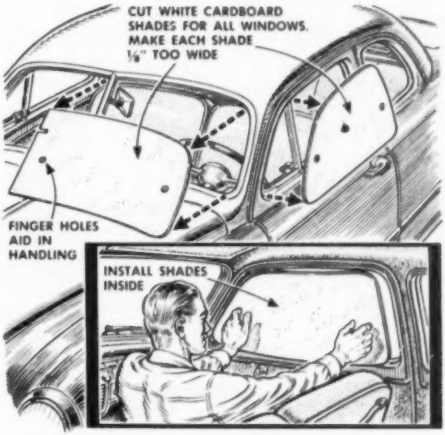
Washing the distributor cap thoroughly with white gasoline may save you the cost of a new one in the case of ignition trouble. A film of grease and dirt inside and outside the cap can cause shorts, resulting in missing and misfiring.



A tire-pressure gauge can only do its two important jobs (stretching tire mileage and tipping you to oncoming trouble) if you keep it where you can always find it for checking cold tire pressures. A pair of screw eyes in a garage wall make a handy rack.



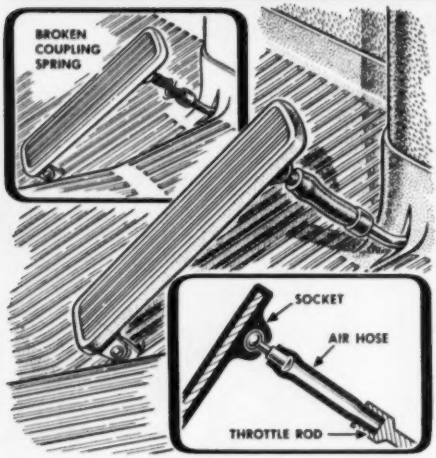
A hasp can be used to hold a garage door open. Screw it to the lower edge of the door so that the extended flap will dig into the ground as the door closes. Fold up the hasp and mount a screw eye in the slot to hold it up while not in use.



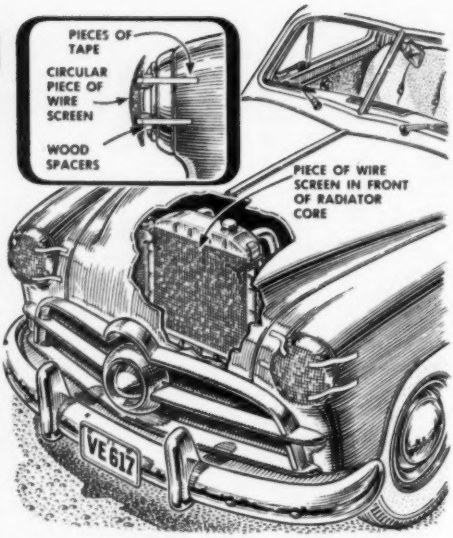
Cardboard shades fitted into the windows and windshield on the inside will help keep your car from heating up like a greenhouse when you must park in direct sunlight. Cut the shields about ½" too big. Spring them in place and they will stay put.

Please turn the page for more auto hints.

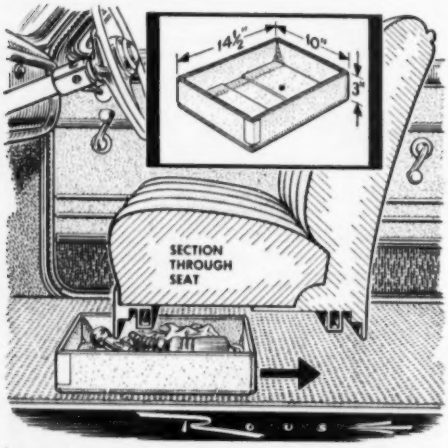
MORE Hints from the Model Garage



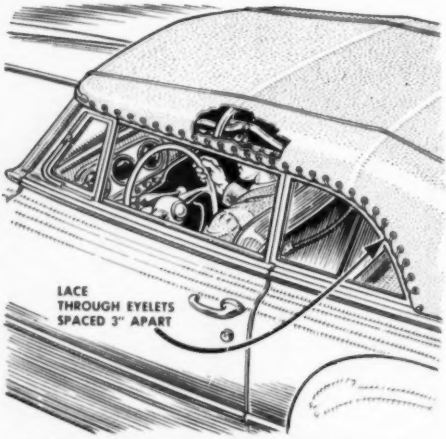
Coupling springs on the accelerators of Ford and International trucks sometimes break as shown in the upper inset. Because few dealers stock the springs, one garage operator gets the trucks back into service while waiting for delivery of factory replacements by installing a piece of air hose. The hose simply twists into place.



Flying stones can break head lamps and damage the radiator when you travel at high speed over the gravel roads that you find in some parts of the country. A piece of screening slipped down in front will protect the radiator core. Round pieces of screening taped over the lenses with wood spacers will take care of the glass.



A flat cardboard box can be slipped under the front seat of some cars to provide additional storage space. A box of the dimensions shown will be suitable in most cases. Such a container will take some of the load off the usual glove compartment.



To keep out drafts during bad weather, one convertible owner spaced black eyelets along the edge of the top and then lashed the top to the frame. This kept the top from drawing away from the frame—and shut out gusts of cold wind.

Push-Button Car Seat You Can Install Yourself

Whether you're lazy or not, it's a luxury to be able to readjust the driver's seat at the touch of a finger.

By Roland P. Loewen

THIS is the story of a de luxe touch I added to my car—an adjusting mechanism that puts the front seat just where I want it at the touch of a switch.

Two convertible-top electric motors, resurrected from an auto graveyard, do the trick. These were designed to raise and lower the top by driving a set of gears and screws. Convertibles built by the Chrysler Corp. just before and after World War II have them.

I dug up two complete assemblies—motors, gears and screws. I also got the relay that guards the motors from overload and the reversing switch that controls them. A few pieces of strap iron and two switches to limit the seat travel completed the materials for the job.

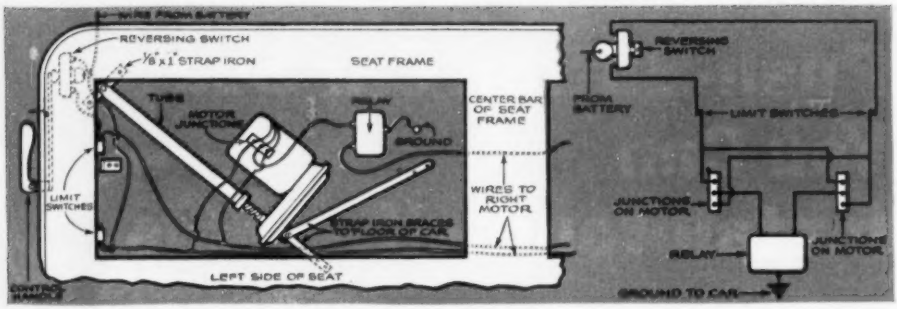
Cleaning and testing the equipment was the first step. I opened the plug, poured out the old oil, took the gearbox apart and washed everything thoroughly. After reassembly, enough No. 30 motor oil was put in to half fill the gear case.

As a test, I connected two wires to my car battery and fastened one to the center junction on one of the motors. I then touched the second wire to each of the other two terminals in succession to make sure the motor would run in both directions.

The second motor was tested the same way and then both were connected through the relay as shown in the accompanying diagram. With this setup both motors

CONVERTIBLE-TOP MOTORS are located at an angle to move seat fore and aft. Gears driven by the motors turn screws in and out to move seat. Seat handle (foreground) controls switch.

LIMIT SWITCHES on left end of seat frame shut off current when seat reaches its forward or rear limit. Pointed piece of strap iron bolted to floor operates the switches.



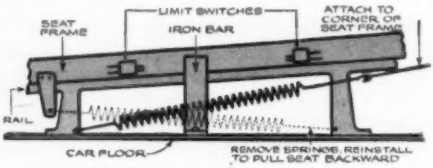
should turn. As a final test, each motor was connected separately through the relay. If the relay is perfect, you should hear it click as it kicks out the connected motor to keep it from running.

Placing the motors. In my De Soto, I found it necessary to mount the motors at an angle to keep the seat frame from striking them in either the extreme fore or aft position. The screw shaft and tube were shortened with a hacksaw to about 12" and a drill was used to make new holes in the tube. If you make a similar conversion, be sure to cut off the clamp end and not the screw end of the tube.

Two steel brackets clamped to the gearbox boss with nuts and large washers were bolted to the floor to fasten down the motor assembly and keep it from twisting. To raise the assembly off the floor slightly I used the original mounting brackets and pins, adding an eye bolt and spacers. In each assembly, the pin was run through the bracket and eye of the bolt at floor level. The bolt itself was run through the gearbox boss, providing the means of attaching the two brackets.

The front corners of the seat frame were drilled and flat steel pieces bolted on for attaching the screw tubes. Before bolting the motors tight, be sure they are placed so they both put the same pull on the seat. It may be necessary to adjust one of the tubes to achieve this. Self-tapping sheet metal screws do a good job of fastening the relay to the floor.

Helper spring. Most seats have a spring at each side to help pull the seat forward. In my case, I found that the seats had a more solid feel, especially during

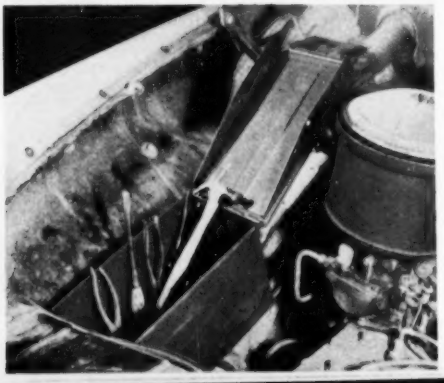


quick stops, after I had reversed them to pull back on the seat. The motors still have plenty of power to shove the seat forward.

Limit switches placed on the left side of the seat frame automatically cut off the current when the seat reaches either its extreme forward or rear position. Regular limit switches with rollers on the ends of lever arms are available in most electrical shops. The 115-volt size will work. A bar fastened to the floor operates the switches.

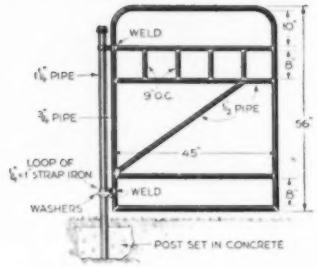
I mounted the reversing switch on a bracket under the seat, drilled a hole in the handle and linked it to the regular seat-adjustment handle. The switch was wired so that moving the handle forward moves the seat forward, moving it backward does the same to the seat.

Box Under the Hood Keeps Roadside Tools Handy



You can relieve the strain on the glove and luggage compartments by mounting a toolbox under the hood of your car. A cartridge case from an army surplus store, a tackle box or any other metal box with a lid will serve the purpose. Attach it with bolts or sheet metal screws. Wrap the tools in cloth to keep them from rattling.—*R. E. Klinck, Cedar Rapids, Iowa.*

This Gate-Go-Round Thrills the Kids



KIDS love to swing on gates, which is often hard on the gates. The gate-go-round I built is even better than a regular one—it swings around in a full circle and we don't worry about what happens to it. The photo and drawing show how I made it. I inserted a 1″ pipe inside the 1¼″ pipe post to add rigidity, since I found the average load to be about five kids. I also left the hinges unoiled. The built-in squeak adds an authentic note.—*Evan Wright, Topeka, Kan.*

Trimming Screen Wire Quickly

WHEN you're making screens, don't worry about cutting the wire to an exact fit in the frame. Cut it oversize on three sides, fasten it down and nail on the molding. Then trim off the excess with a sharp knife. It will cut cleanly and quickly.

Freezer Bag Holds Camera

IF A camera is kept in the glove compartment of a car, the heat that builds up there on a hot day may spoil the film. I keep my camera in an insulated freezer bag, the kind sometimes sold with ice cream. The bag also cushions the camera against shocks.—*A. Huntington, New Bedford, Mass.*

Flashlight Is Explosion-Proof

IF YOU must hunt a gas or gasoline leak with an ordinary flashlight, wrap the light in a plastic bowl cover It will lessen the chance that an explosive vapor may reach the electrical contacts, where a spark might set off a dangerous explosion.

Capsules Make Tiny Oil Cans

MINIATURE oil cans for carrying on fishing, hunting or auto trips can be made from small gelatine capsules, available at drug stores. Fill one half of each capsule, moisten the other half, then push them together. To use, puncture one end with a pin and squeeze out the oil a drop at a time.

How to Put Waste Space to Work

Simple built-ins add extra storage space without sacrificing living space.

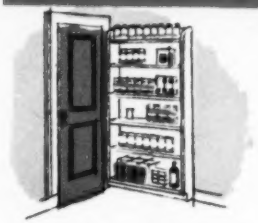
YOU have more space than you think. Lurking under stairs, behind doors and in nooks and crannies are countless cubic feet going to waste. By building in a shelf here, a cabinet there, you probably can double your storage space without noticeably affecting your living space.

Here are some of the principles of good space-snooping:

- If you can't live in it, store in it. Never leave a hole or alcove open that you can close in with a shelf or cupboard. Even though small, they'll take things that would be clutter elsewhere.
- Make the most of little. You'll never miss a few inches stolen from a room, and a set of shallow wall shelves will hold a surprising amount. Built just one glass or one can deep, they'll store things more efficiently than larger shelves that you have to grope around in to find what you want.
- Organize the space you have. Many cabinets and closets are only half used because they aren't properly arranged. Group your things according to size, then add shelves and compartments to take them.
- Keep built-ins simple. You don't need fine-wood cabinetry to hold peach jars or battleship construction for a shoe rack. Simple bookcase-type shelves, perhaps with doors added, will handle just about any storage job. Butt joints and nails will do in most cases and you can rely on paint to cover up a multitude of sins.

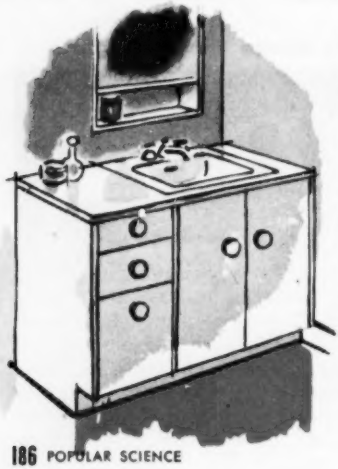
Shown here are places you can expect to find space for the taking. A little space-snooping on your own will probably turn up more.

Steal a few inches of



Near a doorway. Shallow wall shelves butted against a 4" or 5" door casing will hold hundreds of small articles without hampering passage through the door.

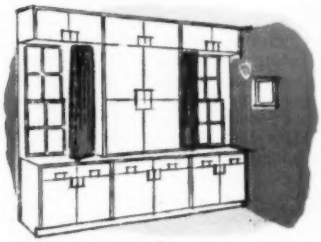
Bathroom built-ins keep supplies where you need them



You can store a lot of towels, toiletries or cleaning supplies under the bathroom sink—and the cabinet will hide plumbing, too. Use sink legs as supports by drilling them for screws or remove them and let cabinet support sink. Space often found at end of tub is a good bet for a tall cabinet to house linen, bath supplies and pull-out clothes hamper. Use ¾" waterproof plywood for both built-ins and seal cracks around sink and tub with calking compound.

wall space where you'll never miss them

Along a kitchen wall. Where you haven't room for a full counter, try shallow shelves. These will hold months of food supplies right where you can get at them easily. For heavy canned goods, lag-screw uprights to studs.



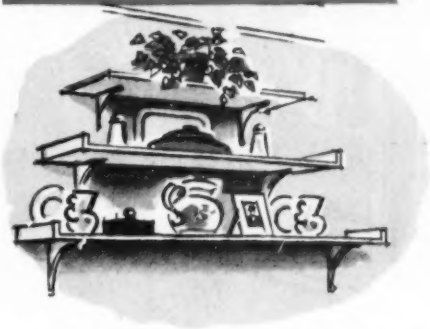
Between two windows. Cabinets around windows are simple to build since you can nail uprights to the window frames. Shelves are then nailed to the uprights at each end and supported on cleats nailed to studs. You can do the same around only one window or between a window and a wall or door.

From a hallway. A wide entrance hall will easily give up 6" or 8" without impeding traffic in and out. A shallow coat closet will hold the overflow of guests' wraps. Storage lockers for toys, cameras and sports equipment, a telephone niche and a primping mirror will give you an entrance hall that really earns its keep.

Dining table disappears

You can trade a few inches of wall space for many feet of floor space with a drop-down table and benches. Folded up, they form doors for shelves that keep dishes handy. Buy seat cushions first, then size benches to fit. Use ¾" plywood and piano hinges for sturdy, handsome job.

Shelves instead of pictures



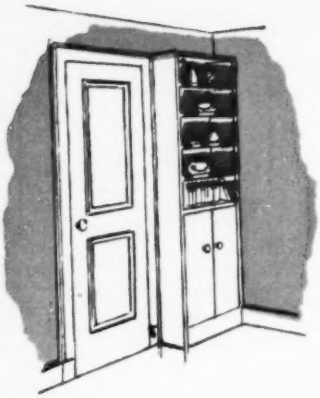
A pyramid of small shelves will make an attractive wall decoration and add extra space for plates, trays and glassware. Make each shelf a little shorter than one below it and use metal shelf brackets painted to match the wall.

Please turn the page for more storage ideas.

Put corners and alcoves to work for you

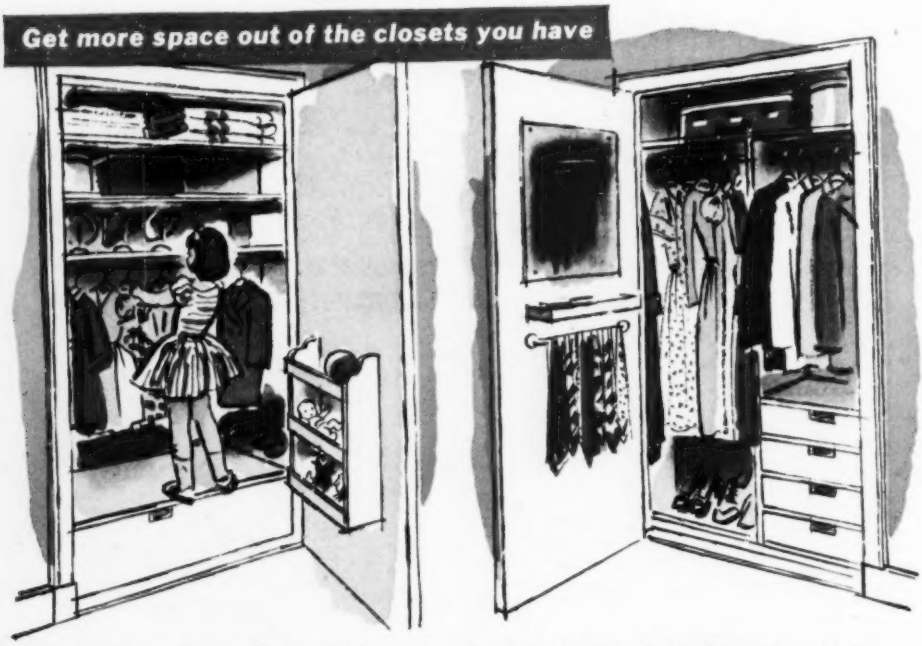
Closing in an alcove gives extra storage, also improves a room's appearance by straightening out walls. Three walls to nail to make built-ins easy. Lower part can be used for a dressing table, as here, or a writing desk.

Corner cabinets provide a surprising amount of storage, yet take little usable space from room. This one is simply triangles of ¾" plywood supported on wood cleats nailed to both walls. You can make cabinets as high as you want, add plywood doors or leave shelves open.



Spaces behind doors don't do anything but collect dust. You can put them to work with storage shelves like these. Nail an upright to the door frame on one side and another upright to the wall, then stretch shelves between them.

Get more space out of the closets you have



Small-size closet for small-size children. A lowered clothes pole that youngsters can reach and racks and compartments for toys will encourage neatness and save work for mother. The space at the top of the closet can be shelved for things you don't want kids to reach.

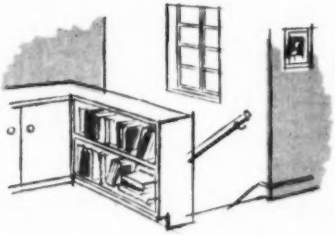
Divided closet has short half for your suits, long half for your wife's dresses. Space usually wasted under suits is filled with shallow trays for shirts, socks, other small articles. Shelf at top holds suitcases, hat-boxes. Tie rack and mirror on door speed dressing.

Make doors do double duty

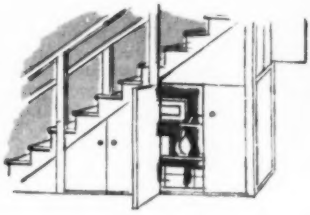
An unused or awkward door may offer an ideal way of gaining storage space while getting rid of the nuisance at the same time. Remove the door, and the opening becomes a ready-made frame for shallow shelves and cabinets.

Two-way storage door has shelves you can reach from either side. Shelves can be hung on brackets or supported by long screws run through door from opposite side. Make cut out by drilling hole first, then inserting keyhole saw.

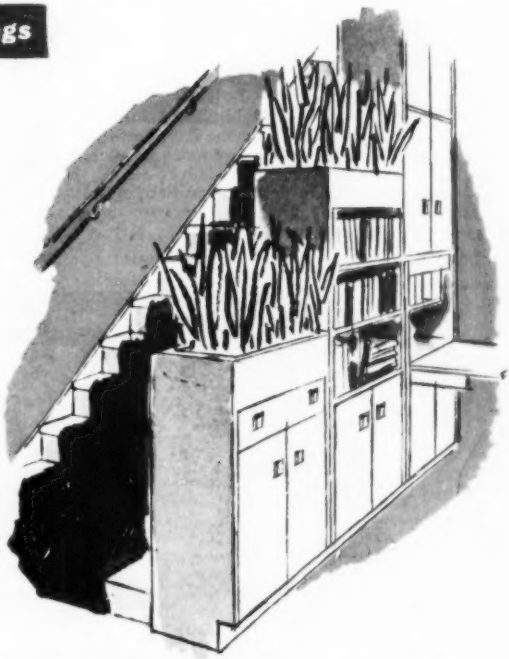
Stairs will store a lot of things



Low bookcase at head of stairs takes little more space than old railing and now does two jobs. Bolt it down.



Shelves under cellar stairs will keep your wife's canning off the pool table and the weed killer away from Junior. Add a niche for fuses, bulbs and other things you need in a hurry.



Open stairway is a natural for a storage wall along exposed side. You can run cabinets up to ceiling or only part way, as here, to preserve open appearance. Wall is ideal for drop-down desk, radio speaker or TV set. Plant boxes are shallow metal trays set in top of wall.

Please turn the page for more storage ideas.

Fit things under the eaves where you can't fit yourself

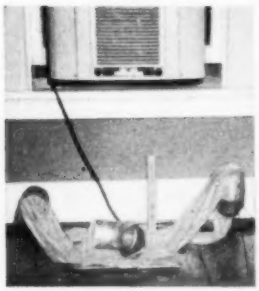
Cabinets under a low, sloping ceiling store a multitude of things in otherwise useless space (above). Alcove in dormer window is good spot for desk or dressing table. You can sit by day and sleep by night on a pull-out bed that slips under the eaves (right). Halfway out, it's a couch; all the way, it's a bed. Cabinets above it hold sleeping pillows during the day, decorative ones at night. If rafters are exposed, you can nail uprights to them and stretch shelves across. If ceiling is covered, and you don't want to cut into it, build cabinets up from floor.

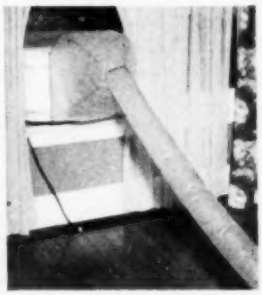
Room divider adds space and privacy

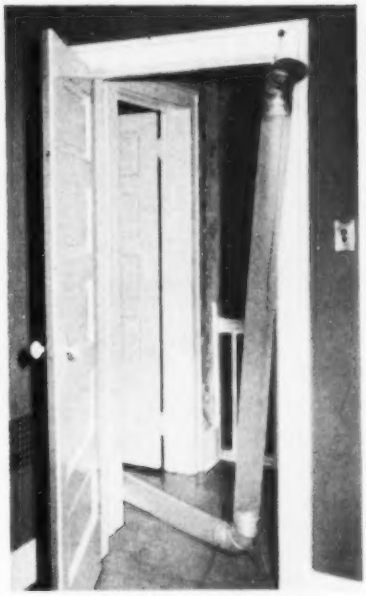
A storage wall will screen off a dining nook or divide a large room into two smaller, more efficient ones. If you build it as a separate unit and then simply wedge it in place, it can be removed at any time without leaving permanent marks. Decorative molding added at top and bottom will hide wedging blocks and make wall look as if it were built in. Lower shelves can be enclosed with doors and the upper ones left open for light and ventilation. Drop-down table could be hinged to dining side for light meals or serving dishes.

Plastic Ducts Extend Reach of Air Conditioner

You can leave the unit in the bedroom, and yet cool an extra room for daytime comfort.







Duct system collapses as at left above for storage in a drawer or closet. The first duct from outlet hood should have a gradual fall to the floor without sharp bends (above, right). Since cool air falls, final duct is hung from a hook as at far right, providing a high outlet. Door is closed as far as possible. If house has floor grills, a downstairs room can be cooled by running a horizontal duct to the top of the grill set in its ceiling.

YOU can't live in a bedroom all summer just because that's where the air conditioner is. But I rigged a detachable duct system that cools any other room up to 20′ away, making my unit do double duty.

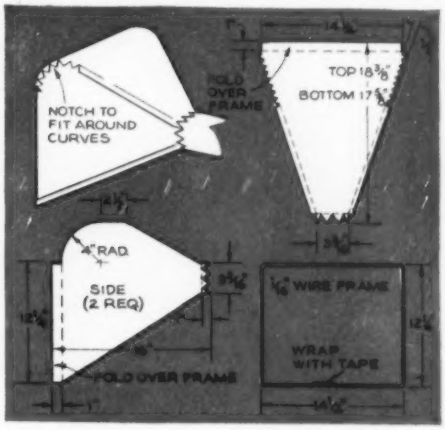
My plastic ducts were homemade of Firestone 4-ply Velon with seams cemented with Le Page's Liquid Plastic. Air is fed into them by a hood of the same material that fits the air conditioner. The pattern shown is for my own, a Mitchell unit. For others, experiment with paper patterns.

Hood. The air scoop or hood has a top, a bottom and two sides. Two edges of the top are notched where they fit around the top curve of the sides. Joints are made with the top and bottom overlapping the sides ½″.

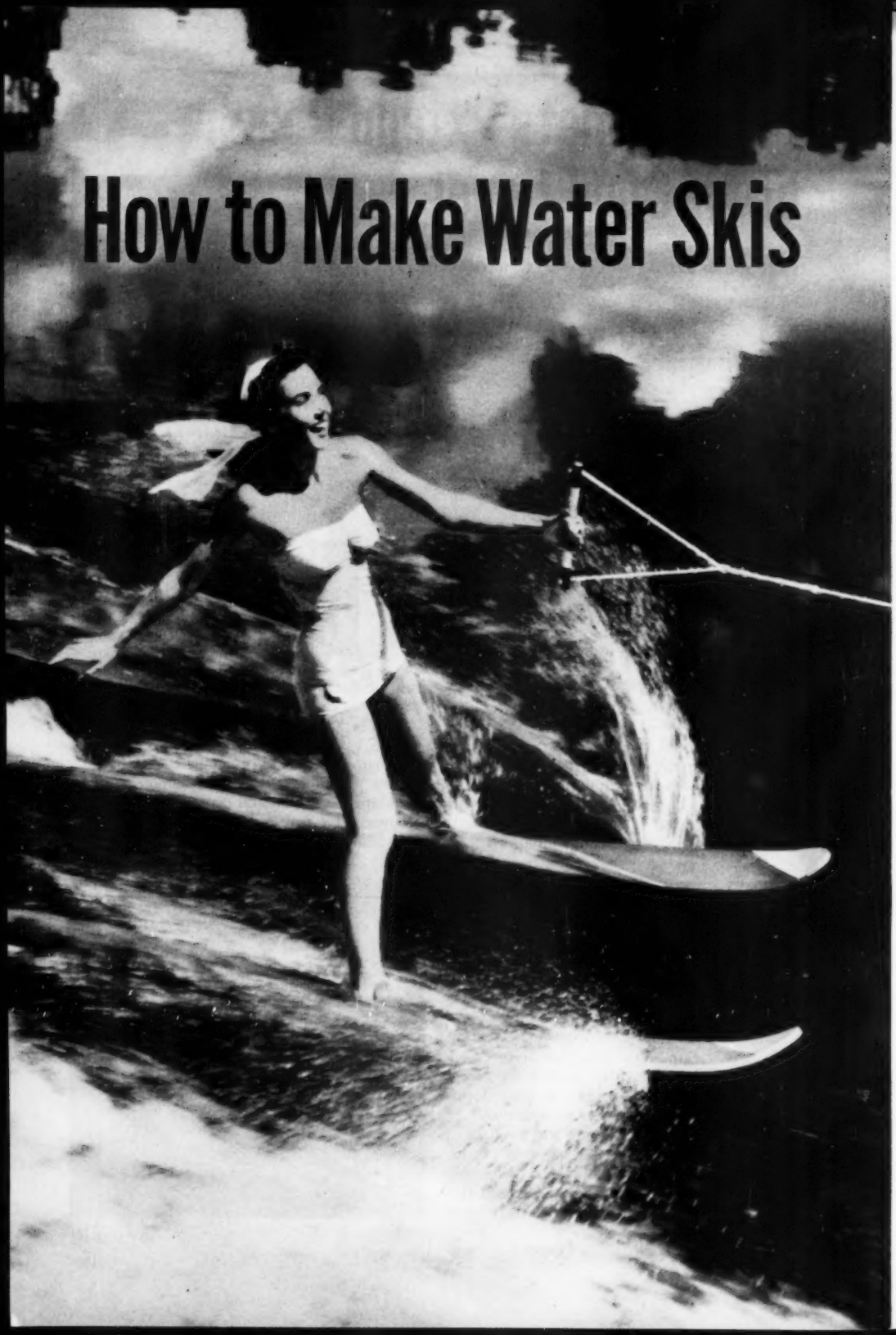
Make a short duct from a piece 13¼″ wide with a ½″ seam. Slip this over a piece of 4″ pipe and insert it in the neck of the hood. Notch the neck and cement it around the duct. Then turn the assembly inside out to cement the duct edges inside the hood.

Fold the 1″ flaps at the big end of the hood around a frame made of coat-hanger wire to fit your air conditioner. Cement the flaps well. Punch two small holes near each side of the frame 1½″ from top and bottom so that cords can be tied on.

Ducts. These are rolled from strips of plastic 13¼″ wide, with cemented ½″ seams. (Be careful not to cement the sides together.) Solder legs of coat-hanger wire to standard 4″ galvanized pipe connectors and elbows. You can hold the ducts on these with large rubber bands.—*Lawrence E. Hough, Richmond, Ind.*



How to Make Water Skis



You can speed to cool summer fun with skis like these, even if you have never tried it before.

By Charles F. Almeida Jr.

BOB COZENS jumped 87 feet on water skis at Cypress Gardens, Fla. Bruce Parker and Evelyn Wolford water-skied 198 miles nonstop from Nassau to Miami.

Chances are you're not going to duplicate either of those feats your first time out on water skis. But you can have a lot of fun this summer skimming along in the wake of a fast boat. It needn't be a Gold Cup racer, either; you'll get plenty of action from a 15-hp. outboard on a 14′ hull.

A pair of water skis is easy to make. You don't even have to steam them to curve the tips. Besides, you'll save yourself a nice buck by building your own. Store skis like these cost about $35 to $40 a pair. The spruce for these cost $3.12. The other materials, besides screws, were scrap.

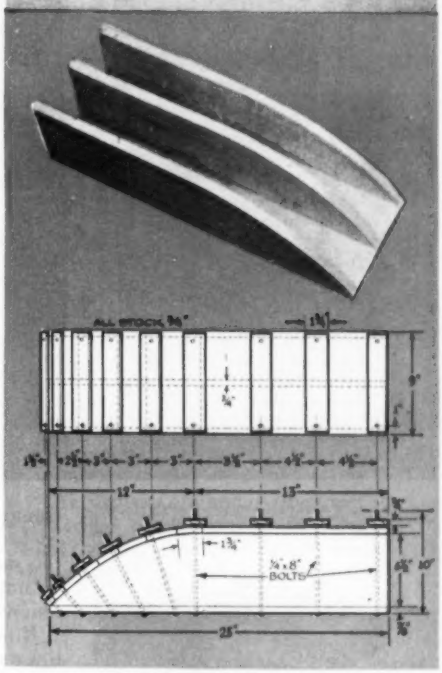
Construction. **Buy yourself two pieces** of ½″ by 6″ spruce. The finished skis are 5′ 9″ long, so allow a few inches for rounding the points and squaring the other ends.

The first step is to edge-rip the spruce for 2′ from what will be the tip. Not having a bandsaw, I ran each edge over my 8″ circular saw. This made a cut 2¼″ deep in each edge. The remaining 1½″ of wood was cleaned out with a handsaw.

Building the bending jig, as you can see from the drawing and photos, is easy. It's only a stout box with a curved top. Once you have the jig, you can turn out an endless number of skis—which can mean cash. I turn out the spruce parts, glued and curved, for $15 a pair. My buyers turn them into finished skis by screwing down the strengtheners, pads and runners.

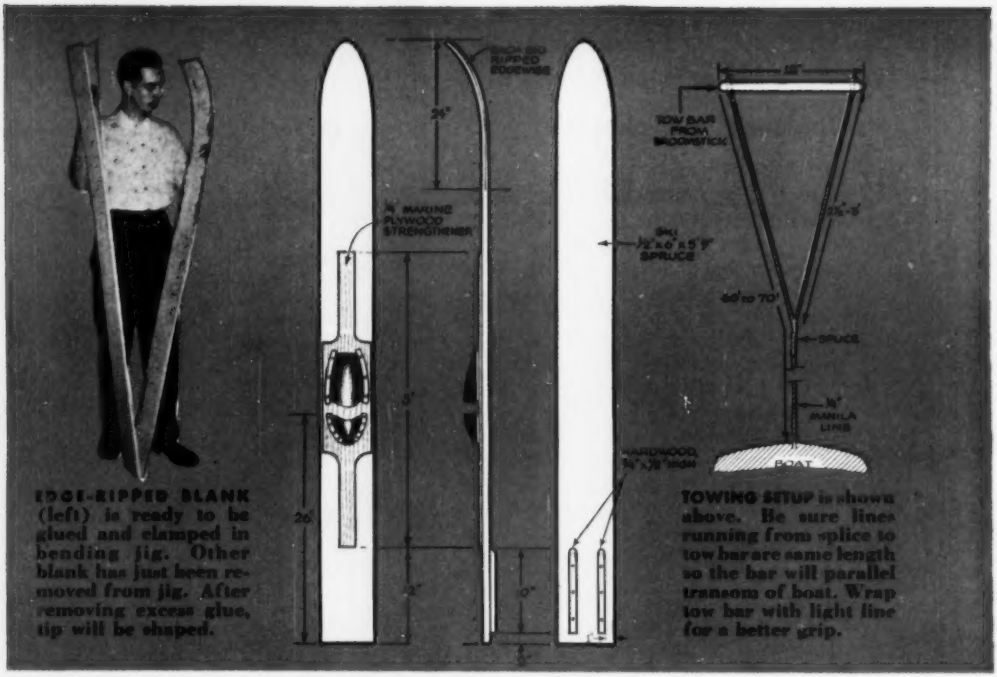
Bending the tips. **With the saw cuts** made, spread the tips of one ski apart and load up the cut with plenty of glue. Use a good waterproof glue and don't spare the stickum. You want both surfaces thoroughly coated. The excess will be squeezed out onto wax paper.

Lay the ski on the bending jig and clamp the tip first. Tighten the first clamp, leaving it just loose enough so the two pieces on each side of the cut can slide past each other when pressure is applied by other clamps. Then tighten the last clamp, but not all the way down. Return to the first



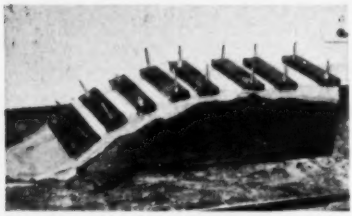
BENDING JIG (top photo) has nine hold-downs each secured by two carriage bolts. Other photo above shows the jig without its top.

SKI BLANKS first were edge-ripped with a circular saw. Since saw blade wouldn't reach through 6″-wide stock, remaining wood was cleaned out with a handsaw (above). Bandsaw, if available, is ideal for this job.



EDGE-RIPPED BLANK (left) is ready to be glued and clamped in bending jig. Other blank has just been removed from jig. After removing excess glue, tip will be shaped.

TOWING SETUP is shown above. Be sure lines running from splice to tow bar are same length so the bar will parallel transom of boat. Wrap tow bar with light line for a better grip.

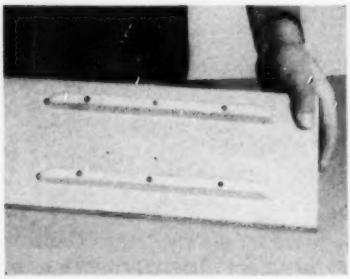


WAXED PAPER—several sheets of it—were laid over jig before ski was clamped down. Paper prevents squeezed-out glue from sticking ski and jig together.

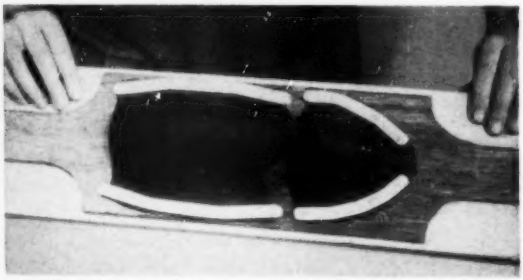
clamp and tighten it a little. Follow by tightening each clamp a little at a time, from first to last, until the ski is firmly clamped to the jig. Leave it in the jig until the glue is thoroughly hardened. When you remove it, sand off the dried excess glue.

Rounding the tips. Bandsawing, of course, is the quickest way to shape the tips. But a series of cuts with a handsaw will roughly shape them. Then you can finish with a rasp and sandpaper. The radius of the curve doesn't matter. Just work for a smoothly rounded shape.

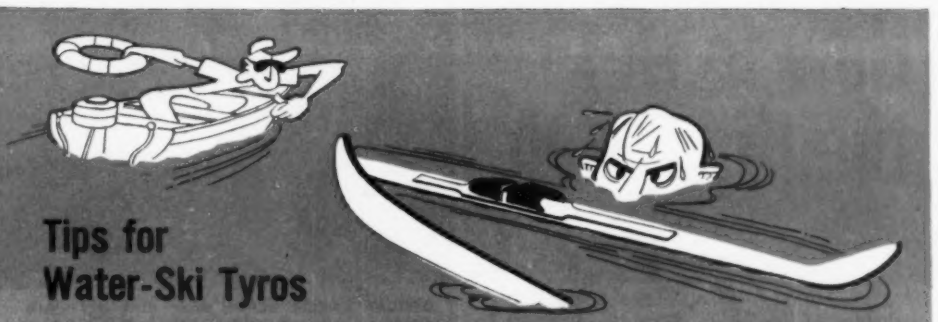
If you are wondering why it wouldn't be smarter to round the tips *before* bending and gluing them,



KEELS OR RUNNERS are located on underside of ski 2" from stern. They are hardwood and are glued and screwed on before ski is varnished.



PANELS on which pads are mounted are ¼" marine plywood, stained dark. Panels strengthen skis. Pads were cut from a truck-tire inner tube. Molding around rubber is 1/16" by ½" aluminum.



Tips for Water-Ski Tyros

If you've never water-skied before, here are some pointers that may ease the way. But you'd better be prepared for plenty of spills before you set yourself up as local champ.

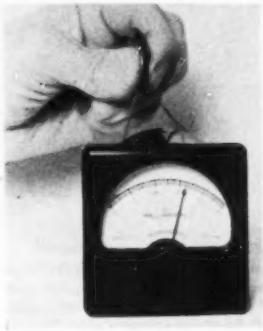
- To start off, crouch in waist-deep water with your elbows outside your knees. Hold the tow bar with both hands, keeping your arms straight, and tilt the skis until the tips are clear of the water.
- As the boat moves, stay in the crouch. The boat operator should keep the towline taut. When the skis are running on top of the water, stand up. Don't try to pull yourself up out of the water by flexing your arms. This will upset your center of gravity and very likely spill you before you are well started.
- Don't try for too much speed at first. Just enough to keep the skis planing will give you lots of fun. And these skis are not designed for jumps, so put off the Cypress Gardens stunts unless you have more heavily reinforced gear.
- You'll get good skiing behind a 15-hp. or better motor on a 14' hull. For skiing behind motors smaller than 15 hp., you can add ¼" to the width of each ski. That will give you more planing surface, making the skis easier to use since wider skis will plane quicker.
- Using a ski prop on your motor will give you more pull. This has a lower pitch but wider blades than a standard propeller.
- One final note: if you haven't yet learned to swim, do all your performing *on shore*.

there's a reason. When you're bending the tips without any preliminary steaming, you want all the strength you can get along the bend. So you don't trim any wood off the skis until after the bend is made and the glue is set.

Making the pads. After the plywood strengtheners are glued to the tops of the skis and the skis have been given six or seven coats of varnish, you can mount the ski pads. An old inner tube will provide the rubber parts, which should be cut to fit the skier's feet.

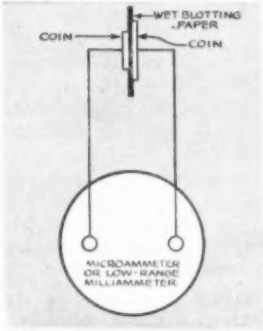
Use strips of aluminum or copper to cover the edges of the rubber, and anchor the whole works with brass screws that go into the spruce.

Here's a trick that will give the skier steadier footing. After the pads are in place, brush varnish on the strengtheners inside the rubber pieces. Then, while the varnish is still wet, sprinkle on a little very fine sand. This will give traction to a skier's wet feet. You can get the fine sand by sifting ordinary sand through your kitchen flour sifter—if your wife doesn't object. END

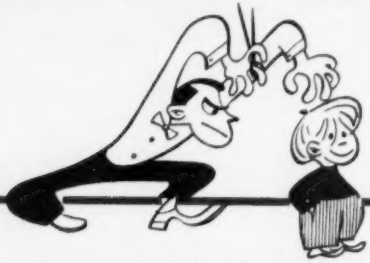


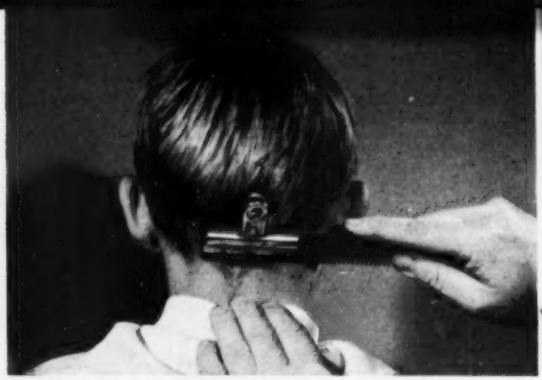
Coins Test DC Meter

Checking the continuity of movement coils in microammeters and low-range milliammeters is easy with a simple coin battery. And you won't burn out the coils or damage the pointers. Make a cell of two coins and wet blotting paper and connect it across the terminals of the meter. A steel penny and a quarter will give the highest reading. A copper penny and a dime give a lower reading.



How to Cut the Kids' Hair





1 ADJUST RAZOR BLADE near end of comb teeth to trim short hair at neckline. Use short, quick strokes. Keep advancing blade as hair is cut. Hold cutter with blade side out.

Here's a choice of two ways you can trim the family—and the budget, too.

IF YOU'RE tired of paying out $1 to $1.75 every time your child takes a trip to the barber, you can beat the high cost of hair-cutting by setting up a home clip joint. With a few inexpensive tools and a Saturday afternoon, you can keep an entire family in trim and save up to $50 a year.

A homemade version of the popular comb-type cutter can be put together with a five-cent paper clamp and a razor blade,

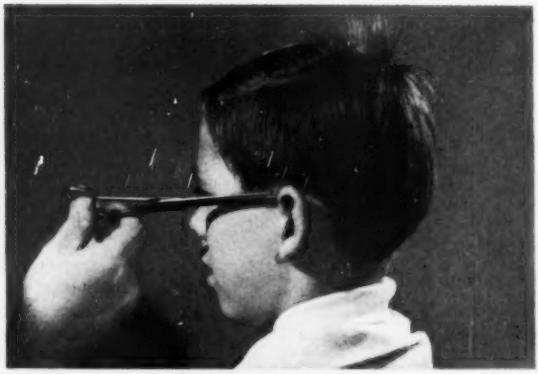
as shown above. A strip of rubber glued to the clamp jaw keeps the blade from slipping. You can control the closeness of cut by simply varying the distance between the blade and the ends of the teeth.

Or you can go strictly professional and use the comb-and-scissors technique. Mail-order houses sell shears, comb and clipper sets for the price of a couple of haircuts.

Get yourself a tall stool and a small boy and you're in business. A dish towel, held on by a clothespin, makes a good barber's cape. Dampening the hair holds it in place so you can see better how you're cutting and helps keep it from getting under the collar.

The photos show how both the razor-cutter and scissors methods work.—*Ken Murray, Colon, Mich.*

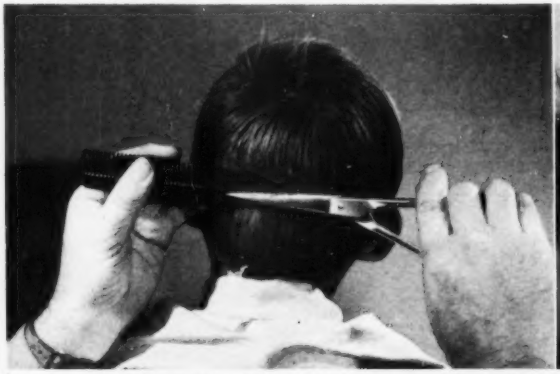
4 COMB AND SCISSORS can be used in place of cutter. Rest finger-operated blade on comb and move thumb-controlled blade. Raise hair with fine teeth and trim ends.



7 OUTLINING AT EDGES gives neat look. Comb hair down and start at sideburns. Use point on ear as guide and keep checking other sideburn so both are cut same length.

2 WORK COMB UPWARD, gradually withdrawing blade from teeth as you cut longer hair near top of head. Hold cutter so it trims only ends of hair for a tapered appearance.

3 TRIM SIDEBURNS with blade set about ⅛" from ends of teeth. Teeth will keep blade from cutting too close. Then adjust comb for bigger bite and work back along sides.



5 AS YOU WORK UPWARD, remember that hair toward top of head should be longer, so take only a little off at each cut. Comb hair down often to inspect for over-cutting.

6 COMB TOP HAIR FORWARD, then pick up small section between two fingers and snip off ends showing through. Repeat from front to back and along sides for even trim.

8 AROUND BACK OF EARS use comb to steady shears as you continue cutting outline. Work from neck up, shaping a line first, then go back to snip stray hairs.

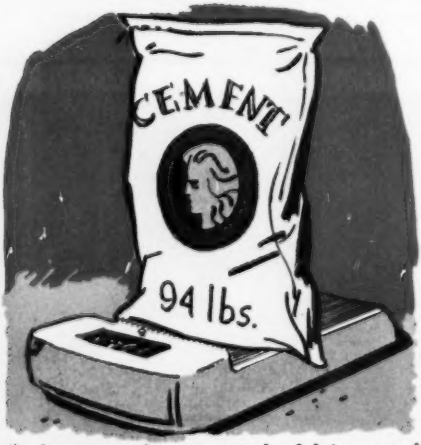
9 FINISHING TOUCH is to trim off neckline with electric razor. Clippers or safety razor can also be used. Remove stray hairs down to collar line, then soften hairline.

KEEPING THE Home SHIPSHAPE

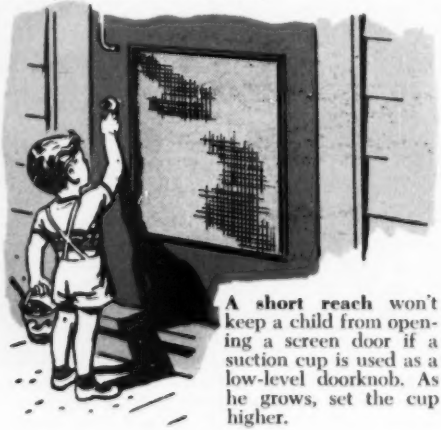
A kneeling pad with tool pockets lets you lift down everything at once when you're ready for garden chores. An old plastic tablecloth or shower curtain will make the case. Fill with a sponge-rubber pad.

Moths won't attack woolen scarves, caps, mittens and socks if they are well cleaned, then packed in food-freezing bags and sealed shut with a warm iron before storing.

For slow, gentle watering of ornamental plants, a cotton work glove tied around the nozzle of the hose works well. Turn on water so just a steady trickle is fed to roots.

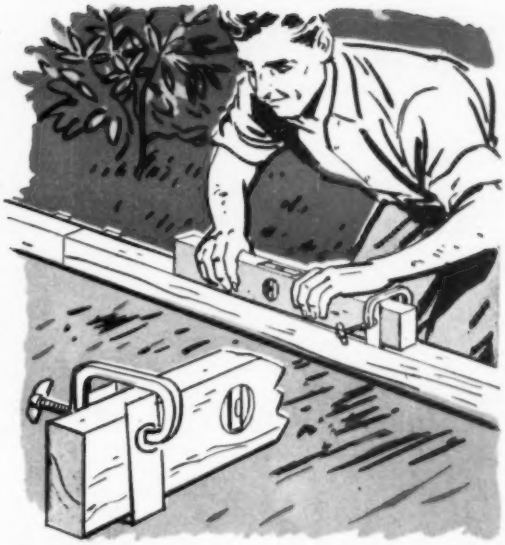


Bathroom scales suspected of lying can be taken to garage or cellar and tested with a bag of cement, grass seed or fertilizer. Be sure bag is set squarely on scale platform.



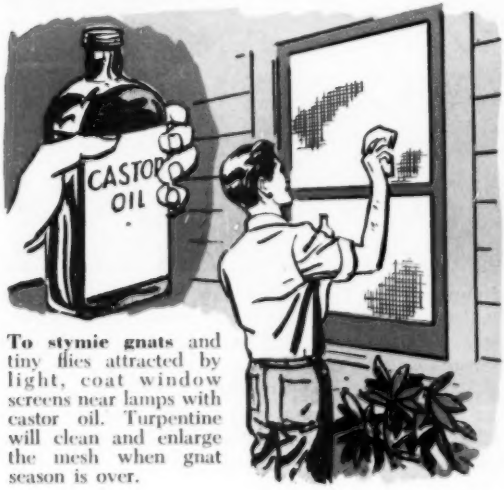
A short reach won't keep a child from opening a screen door if a suction cup is used as a low-level doorknob. As he grows, set the cup higher.

Lost the bottle cap? A candle stub is an airtight stopper that won't stick. If fit isn't right, soak the stub in boiling water to soften it for shaping.



To adjust a level for laying a sloping walk, clamp a U-shaped piece of metal over it at the proper spot to tilt it to the required angle.

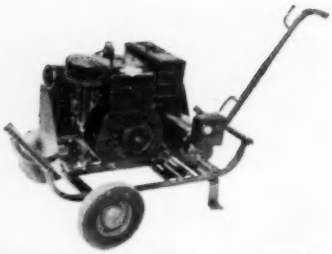
Trousers hang right side up with no need to empty the pockets if two wire hangers, Bent to fit, are slipped through the belt loops at either side.



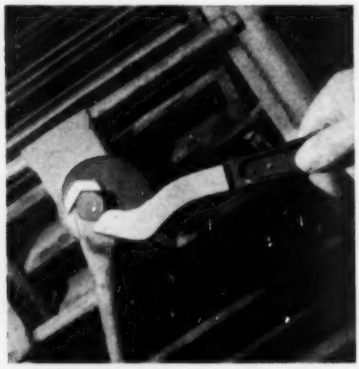
To stymie gnats and tiny flies attracted by light, coat window screens near lamps with castor oil. Turpentine will clean and enlarge the mesh when gnat season is over.

Scouring scaly paint from siding is a breeze when two hands push the brush. A short leaf from a car spring gives a curved, knuckle-saving grip when bolted to the brush. Screws driven into the wood at each side keep it from turning during the operation.

New Tools



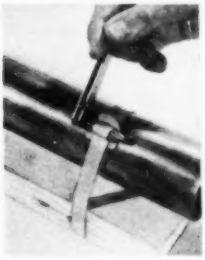
1 Electric Chain Saw. By making two cuts from opposite sides, the 14″ blade on this new saw will fell trees up to 28″ in diameter. It weighs 18 lb., is light enough to take up in a tree for limbing and pruning. The AC-DC motor draws 10 amps. at 115 volts, and drives the chromed chain at 1,400 feet per minute running free. Ball bearings and a worm-gear transmission are used. Log-gripping teeth on both sides of the chain hold the saw against wood, their upward slant helping to draw the chain down through the log. The cutter bar meets the motor case at an angle also, keeping the chain out of the dirt. The saw is priced at $99.50. For remote locations, the maker also offers gasoline-powered electric generators.



2 Wrench Is Self-Adjusting. One jaw of this wrench is actuated by a spring that automatically snaps it in place on the nut. The "One-Hander" wrench is made in four sizes from 6″ to 12″ to take nuts from 3/16″ to 1″. Another model has serrated jaws for pipe.

3 Drawing Aid Fits Briefcase. You can turn out sketches and drawings anywhere—in your office, at home in an easy chair or while traveling—with this 14″-square board and drawing device. The transparent template moves anywhere on the board for ruling vertical, horizontal and angular lines as well as circles. Paper can be carried in a pocket in the cover.

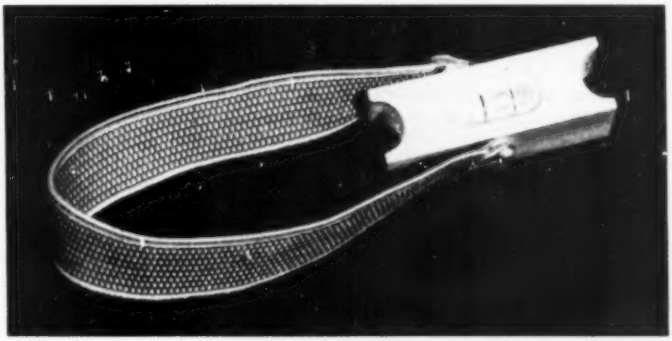
4 Pipe Straps Come in 100′ Roll. Everything needed to make dozens of strap clamps is packaged in one can. The bottom of the can holds a 100′ roll of galvanized mild-steel strap. Buckles, cotter pins and a ratchet wrench are in a tray on top of the roll. The circumference of the can is marked in inches to speed measuring of the strap as it is pulled from the can (above). After the strap is wrapped around the work and passed through a buckle, it is tightened with the wrench (left) or a cotter pin. Uses include hose clamps, muffler and tailpipe repairs, holding BX cable to supports and fastening TV antenna masts. WrapLock is made in ¼″, ⅜″ and ½″ widths and in 50′ rolls of stainless steel.



5 Masonry Drill Won't Stall. Dust packing, which causes stalling, is overcome in this drill. A combination of oval flutes, narrow lands and a fast spiral carries dust out of the hole as soon as it forms. The drill is made of alloy steel with a carbide tip. Sizes range from 11/64″ to 1″.

6 Torque Wrench Releases Itself. When the preset torque is reached, this wrench automatically releases itself, then resets the torque when you let up on it. An enclosed spring under compression is the principal torque-controlling element. The desired torque is set by turning the micrometer-type adjustment on the handle. Models are available with a plain head or a reversible ratchet head (above).

7 Level Fits Electric Drills. The elastic band holds this level to the casing of a drill for horizontal or vertical boring. It also can be used when adjusting a camera on a tripod or when leveling machine tools. Dimensions of the unit, less strap, are ⅝″ wide and 2″ long.



Further information on these tools may be obtained from: 1. Porter-Cable Machine Co., 12 Exchange St., Syracuse 8, N.Y.; 2. Thrifttool Sales Co., 122 E. 25th St., N.Y. 10; 3. Quickdraw Co., Ltd., 127 Gunnersbury Ave., London W. 3, England; 4. Dombert Distributing Co., P.O. Box Gedney Sta., White Plains, N.Y.; 5. Holub Industries, Inc., Sycamore, Ill.; 6. Plomb Tool Co., 2248 Santa Fe Ave., Los Angeles 54, Calif.; 7. Speed-O-Bore Mfg. Co., Inc., 516 Fifth Ave., New York 36.

How to Photograph Your Car

Says this veteran pro: beware of reflections, pick a good background, choose a hazy day —and think before you shoot.

By Grancel Fitz

EDITOR'S NOTE: *Grancel Fitz has been an outstanding advertising photographer for more than 30 years and has captured on film the glamour of most of America's famous cars. When he's not photographing automobiles, Mr. Fitz is likely to be found hunting big game—with both rifle and camera.*

MOST of us have a fond recollection of some car we've owned—maybe several of them. Perhaps it's the roadster we drove to the senior prom, or the sedan that made the long trip with the kids home to grandmother. Whatever it was, the chances are that today we'd get a big boot out of a good picture of that car—if we had it. But most of us never bothered to shoot the old boat when it was around.

So if you take a good picture of the car that's now in your driveway, you'll probably prize it 10 years from now. Making a really good auto picture isn't very hard—if you plan to use more thought and less film. But it's not something you can do in an odd hour unless you have the problems pretty well licked before you start.

Models outside car add human interest. Place

NO SUN, BUT GOOD DIFFUSED LIGHT, helped make this a good picture. The brilliance results from increased negative development. Note the tremendous depth of field.

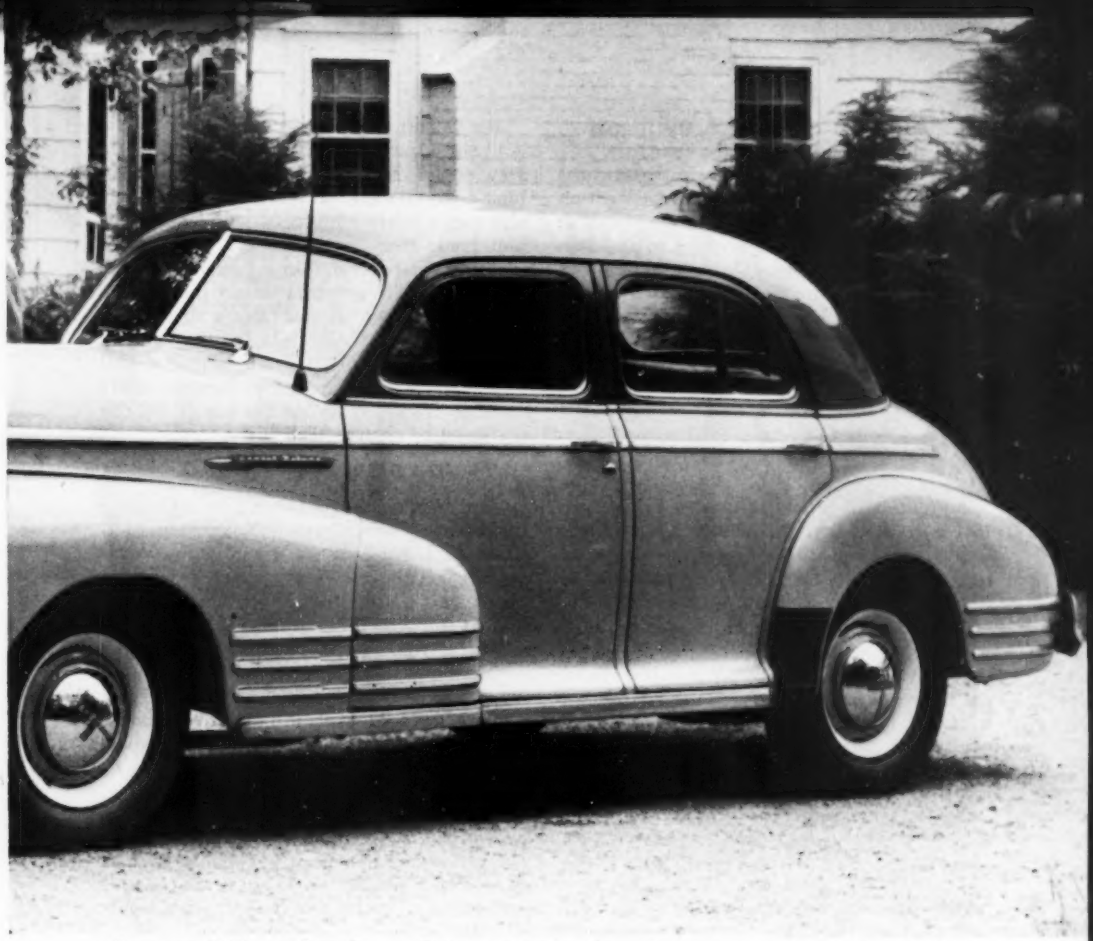
Photo from Pontiac Motor Co.

The finest photographs of cars ever made have been used in automobile advertising. Advertisers pay for the best—and they get it, too. To learn a lot about photographing your own car, just study the ads.

The Right Background Makes the Picture

The most effective way to photograph an automobile is usually in a sort of seven-eighths side view, so that you can see something of the front. The height of the camera should be between your waist and eye level.

Begin by scouting around to find the right location. The background is the last thing the amateur usually thinks about, but



them carefully so they do not distract attention from it. *Photo from Chevrolet Motor Co.*

it is the first concern of a good pro. More than any other single factor, it makes the difference between a fine picture and just another snap. I've sometimes driven 200 miles before finding just the right location.

In choosing your background, think of two things. One is the story it tells. You may want the car in front of your home, or the country club, or some beautiful landscape you're fond of. But remember also the technical problems a background presents. For example, pick a fairly dark background to show a light car and a light background for a dark paint job. But your biggest background headaches will stem from the fact that your shiny new automobile is really a complex series of mirrors. The car top usually reflects the sky and will appear very light, even if the car is black. But the reflection of a tree trunk or telephone pole can cut your shiny top completely in two.

To avoid bad reflections you may have to shift the car inch by inch until they explain and enhance the contours. But you must also end up with the car effectively placed in the picture. If the background doesn't permit this, you'd better move.

How to Get That Streamlined Look

Remember that when your car is facing slightly toward you on level ground perspective will make the rear wheels look higher than the front ones. It will have more of a streamlined look if the rear wheels appear nearly on the same level. So just head the car uphill on a gentle grade.

Another trick to play up the sleek design is to compress the rear springs. A pro would clamp them down or pack 400 pounds of sash weights into the trunk. Perhaps you

can persuade a couple of hefty friends to sit on the floor in front of the rear seat.

The angle of the sun of course governs the direction of shadows. A perfect location at 10 in the morning may be worthless at three in the afternoon. It pays to learn in advance the short period when the angle of light is best for your composition.

A blazingly bright sunny day that a lot of people would call perfect picture weather provides the worst possible light for photographing a car. It is much too contrasty. The ideal sunshine is so soft and hazy that you can hardly see your own shadow. Then you can get detail into the tires, for instance, without overexposing all the bright areas.

Soft sunlight is needed if you are working in color. But if you're shooting black-and-white, and particularly if you develop your own negatives, a completely overcast day is better than a glaring sun. Just develop the negatives longer than usual to build up brilliance.

If your hazy day clears up a bit, you'll get some dazzling suns on the chromium trim and possibly on parts of the body. A pro would dull them with condensed milk, using a sprayer like a gigantic airbrush. You can do a good job with soft putty if you're careful. Put it on the bright spot and smooth it out gently to an imperceptible edge. Remember that the bright spot is the one you see in the camera and nowhere else. It will move when the sun moves, so your puttying must be done at the last minute.

Forget Your Flash Attachment

Even if you have a flash attachment, be cautious about shooting a bulb to open up outdoor shadows. The probable result will be a bad reflection of the bulb. Although professionals often photograph cars by artificial light, this requires a lot of time, equipment and patience.

You may want to put your family or friends to work to give the picture some human interest. Look at the ads and you'll see that models are rarely placed between car and camera. A single figure is sometimes shown close to the rear edge of the front door, where it detracts as little as possible from the car itself.

And be sure to remember that this is a picture of a car, not of the background or people. Don't have the models looking at the camera. Try for a natural, storytelling situation that will spot them effectively in the composition.

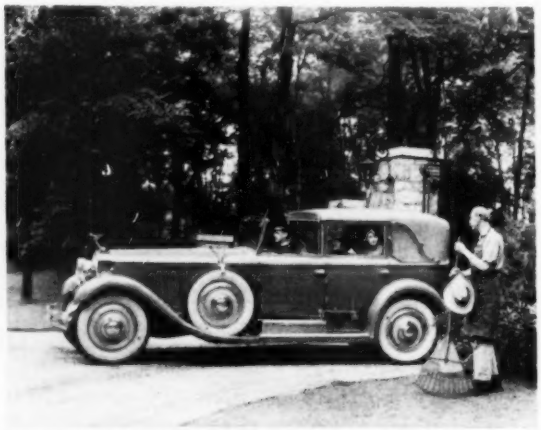
We've left the camera until last. A pro is likely to prefer an 8″ by 10″ or 5″ by 7″ view camera because the ground glass gives him a good view of his picture. He will also use a fairly long-focus lens, which lets him back away from the car for a more pleasing perspective. But if you stand where he does you'll get that same perspective with any camera. If you have a short-focus lens you need only enlarge the smaller image of the car that your negative will show. Of course miniature-camera users can't go back too far or the image will be too small to enlarge well.

You Don't Need a Fast Lens

Fast lenses are completely unnecessary. Instead of f/3.5 or even f/8, you will stop down to f/22, f/32 or possibly f/45, depending on the composition and the size of your camera. The bigger your camera, the smaller stop you'll need.

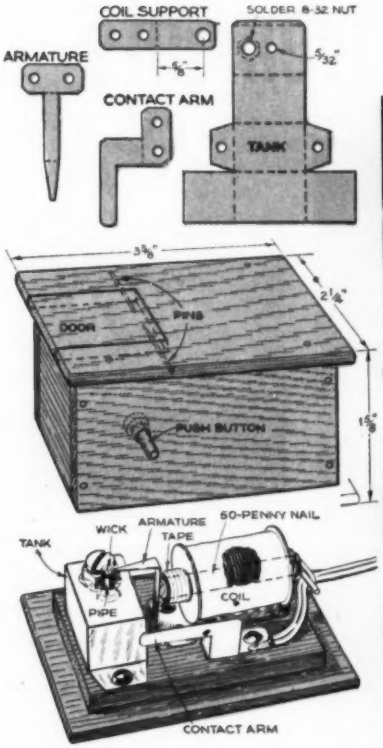
Use a tripod by all means. Use an exposure meter if you have one. Panchromatic film is best, with a suitable filter if your picture includes a sky with effective clouds. Don't try to do the job with one exposure. Even the pros shoot a second film twice as fast, and another half as fast as the first one.

With the right location, the right quality and direction of sunlight, and with intelligent use of models, you can make a good picture with almost any camera. But if you neglect these, you will get poor results with the finest possible equipment. END



"BEST CAR PICTURE I EVER SAW" was Edsel Ford's description of this Fitz shot of a custom-bodied Isotta-Fraschini. Passenger is posed at window to prevent underexposure.

Electric Cigarette Lighter Burns Kerosene



LIGHTER FIRES UP instantly on spark from 115-volt coil. Asbestos glued to hinged lid prevents searing wood.

War-built lighter never misses, runs for weeks without refilling.

WHEN the Japanese occupied Java during the war and matches became very scarce, several of us there rigged up home-made electric lighters. Basically a 115-volt buzzer, the lighter has a kerosene wick ignited by sparking of the buzzer contacts. Though restricted by its power cord to desk or table use, it works without a miss.

Coil. **This is a 50-penny nail tapped at** the head for a mounting screw and fitted with two ¾" plastic disks, taped on 1" apart. The space between the disks is wound about two-thirds full with No. 36 enameled magnet wire, covered with tape.

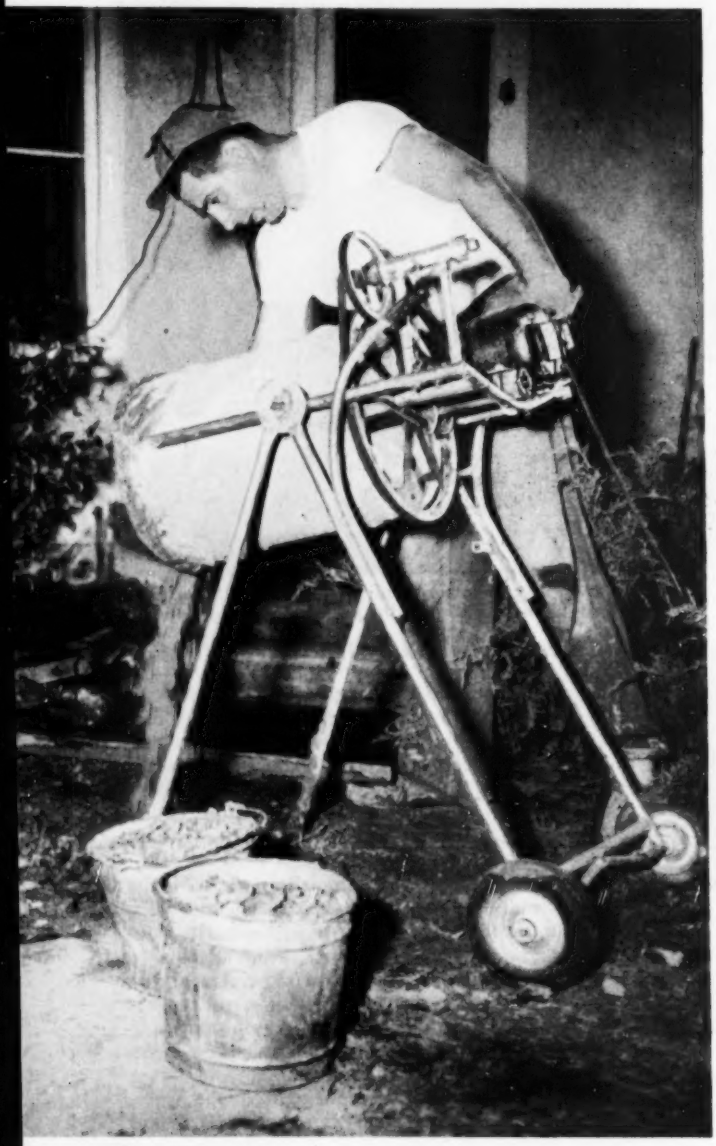
Fuel tank. **This is bent and soldered** from a 2¾" by 2¾" piece of tin plate. The wick, a bit of drapery cord, fits in a tube rolled from tin and soldered in place. A soldered-on nut makes the filler hole, with a machine screw for the plug.

Kerosene is the best fuel, since it won't evaporate fast from the uncapped wick. For reliable ignition, cut a tiny V at the top of the wick tube, just where the armature strikes it. Tin plate will do for the armature (which must be a magnetic material) and for the contact arm. The coil support should be of heavier stock.

Mounting. **Assemble the parts with the** armature 1/16" from the coil and the wick tube just touching the armature. The contact strip is fastened ¼" from the tank. Solder lamp-cord leads to one coil wire and to the contact strip. The other coil wire is soldered to the armature.

Pushing on the dowel button presses the contact strip against the tank, completing the circuit and causing a spark at the armature tip.—*L. Unger, Westerpark, Java, and Karl Greif, Vestal, N.Y.*

Power Concrete Mixer Eases Home Improvements



Supporting frame. Two identical sides with handles are welded over layout drawn with chalk on cellar floor. Sides are braced to stand vertically and cross members added. Short lengths of 7/16" rod for axles are welded into lower cross member at rear.

Pouring yoke. Cross members of the yoke are bent 1¼" below level of side members so that mixer-shaft bearings will be centered. Motor is ⅓ hp., 1,725 r.p.m., fitted with 1½" pulley. Speed-reduction shaft and pulley ratio turn drum at 43 r.p.m.

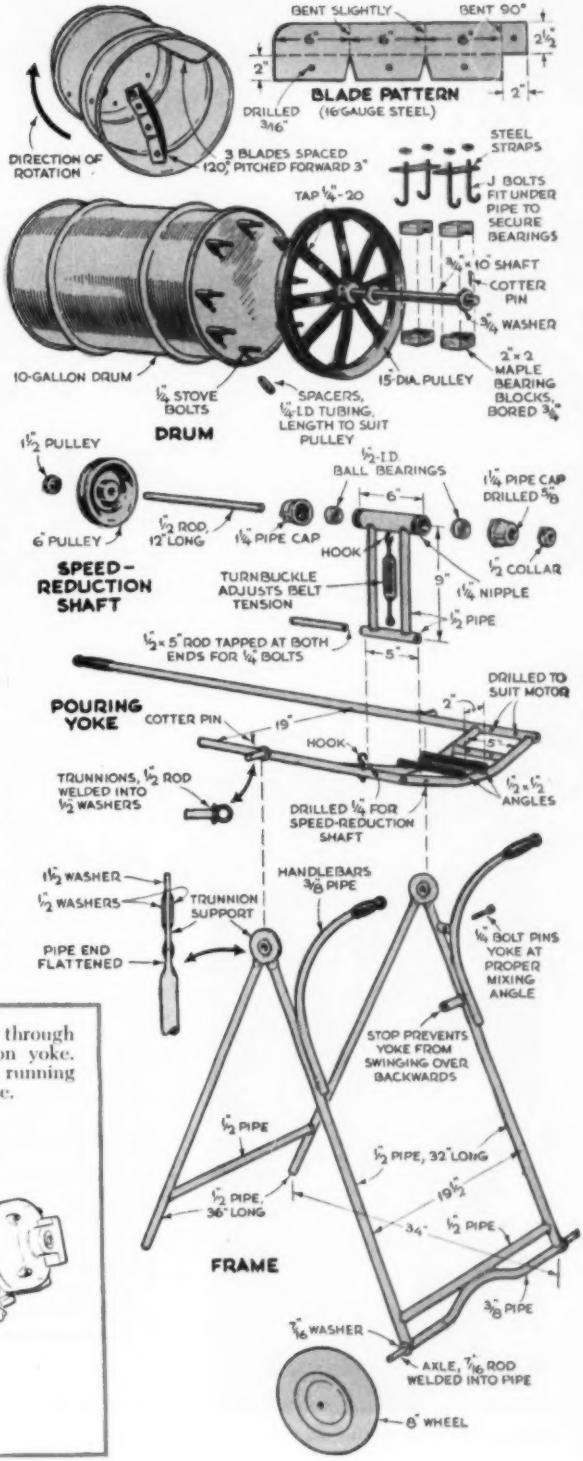
This midget mixer is just right for a one-man job. It'll mix concrete as fast as you can spread and smooth it.

A FEW spare hours spent building this mixer will save you many hours with a mixing hoe when you tackle that new driveway or barbecue.

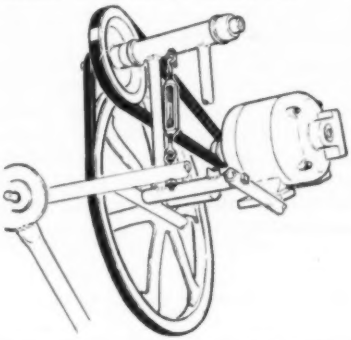
Though its capacity is small, the mixer is no bottleneck on the job. I get through more bags of cement in less time than I did with a rented quarter-bag job. The 10-gal. drum is a type commonly used for soda-fountain syrups, paint and bakers' supplies. Mine is 15″ in diameter and stands 18″ high.

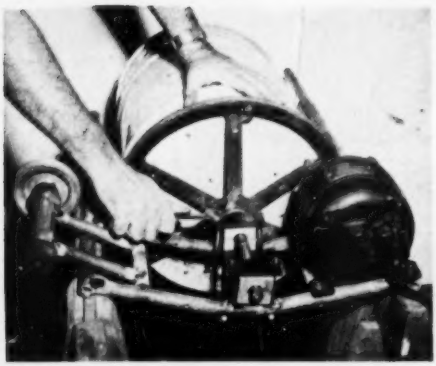
In or out of doors. The convenient handlebars permit you to roll it like a hand truck, and easily get through a basement doorway. The front legs of the frame can stand in a shallow form when you pour, eliminating the need for a chute or wheelbarrow.

Construction. A light welder, electric drill and hacksaw are the tools you'll need. Materials can come from a plumber's scrap pile—¾″ and ½″ pipe, and a few short pieces of ½″ rod. The mixing blades are bent from 16-gauge sheet steel and bolted to the inside of the drum at a slight angle in the direc-



V-belt drive. Power is transmitted through a speed-reduction shaft mounted on yoke. Turnbuckle adjusts tension of belt running from motor. Other belt must fit close.





Maple bearings, soaked in oil and dusted with graphite, support drum shaft. Steel straps and J bolts secure bearings. With motor, drum and all parts in place, yoke is balanced to locate trunnions. These are welded 4" forward of balance point so drum swings up.

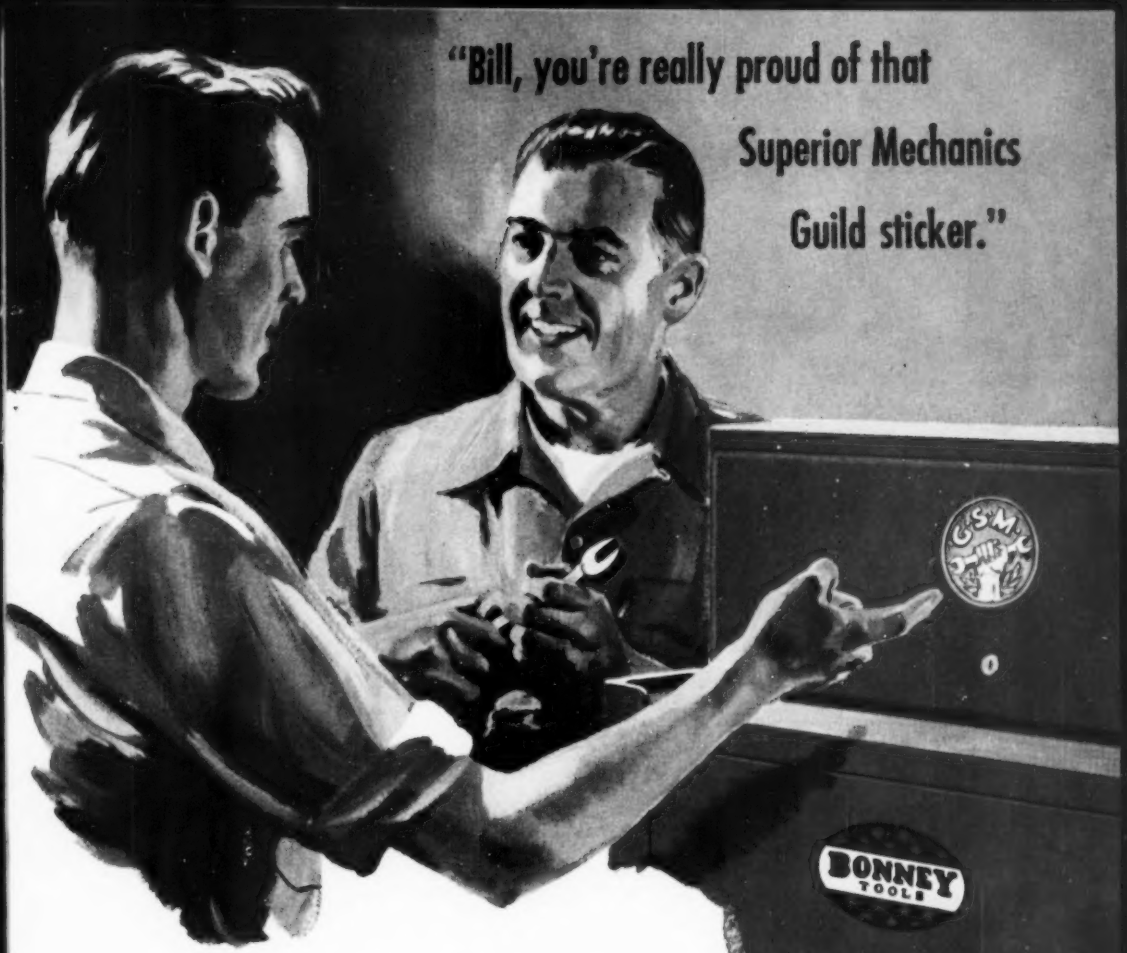
tion of rotation to toss the mix toward the bottom of the drum.

Speed-reduction shaft. A ½" inside-diameter ball bearing is housed in each pipe cap to support the pulley shaft. The shaft assembly pivots on a ½" rod held between the yoke cross members by ¼" bolts.—*Evan Wright, Topeka, Kan.*

Loading up. Mixer takes about a tenth of a bag of cement for most sand-and-aggregate mixes. In final assembly, the frame is sprung apart just enough to admit the trunnions into the supporting washers. Cotter pins prevent trunnions from slipping out and keep frame from spreading while mixer is moved about.

Watch Out... in MAY for floods. After the ice and snow melt, or when heavy spring or summer rains pour down, the nation's rivers often break loose.

SINCE the Indians, there has been one rule to follow when a flood threatens: Get out! In many towns, **Red Cross or city hall maps show how much the river must rise before water will reach your home. Study them and heed daily warnings from the weather bureau. Move furniture and possessions upstairs, then move out yourself, taking your best clothes, toilet articles and valuables. Also take shovels, rakes, boots, mops and rags to clean up later. Boil drinking water and take preventive shots if the authorities say so. Return home only when it is announced that it is safe to do so.**



"I sure am, kid. As proud as you are of your reputation as a hotshot trouble-shooter. I'm proud of the tools in that kit too.

I felt lucky when they picked me for that award. You'll be the next in the shop to get it—so save your wise talk. You're smart at using your head. Be smart with your hands, too, and never use anything but those Bonney knuckle-savers.

Here's some more good advice: 'If you're short, buy BON-E-CON* tools.' Either way, they're topnotch tools at the right price."

BONNEY
TOOLS

** The new Bonney economy-priced line*

Remember. Your local Bonney Jobber, as well as Bonney, stands behind the tools you buy. He has Bonney tools priced to fit your needs as well as your pocketbook.

BONNEY FORGE & TOOL WORKS . . . ALLENTOWN . . . PENNSYLVANIA

See how Kodachrome Film opens up all the ways to

enjoy the magic of color

Kodachrome is one of the most rewarding of all films. Here are all the ways you can enjoy it. And on opposite page are moderately priced Kodak cameras for Kodachrome pictures—and other special color equipment. Color is easy and inexpensive the Kodak way.

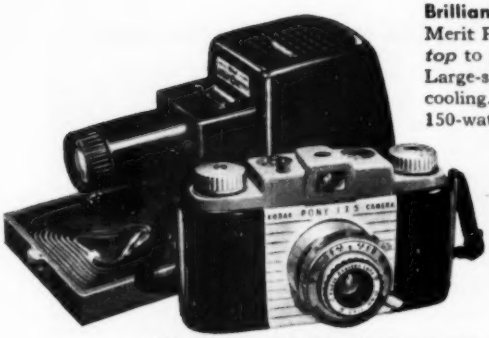
↑ A Kodachrome transparency costs as little as 16¢ complete

You can project it → for brilliant, large-group shows

You can enjoy convenient ↓ viewing for small groups

↑ You can give Kodachrome Prints to friends and relatives

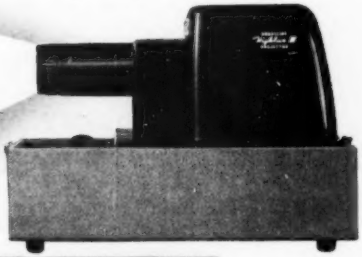
And Kodachrome ↑ Enlargements up to 8 x 10 inches make handsome gifts for special occasions



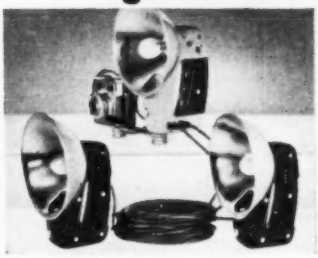
Brilliant, inexpensive slide projector—The Kodaslide Merit Projector features the new-type slide feeding in *top* to prevent jarring projector when changing slides. Large-size lamphouse of new design assures efficient cooling. Built-in elevating mechanism. Powerful 150-watt lamp. $26.10. Carrying Case, $7.50.

Thrifty color camera—The famous Kodak Pony 135 is a lightweight, heavy-duty 35mm miniature. Makes superb color slides on 20- or 36-exposure Kodachrome Film. Kodak Anaston *f*/4.5 Lumenized Lens; built-in flash synch. Speeds to 1/200. $35.75. Flasholder, $8.25.

Wonderful "miniature"—The Ektar *f*/3.5 Lens on the Kodak Signet 35 Camera gives you *extra* color purity in each Kodachrome shot. The only miniature with ball-bearing action for ultra-smooth focusing. Spring-loaded bearings in range-finder mechanism eliminate play, insure supreme accuracy. Unusually compact. Built-in flash synch. Speeds to 1/300. Automatic film count, stop, and double-exposure prevention. Only $92.50.

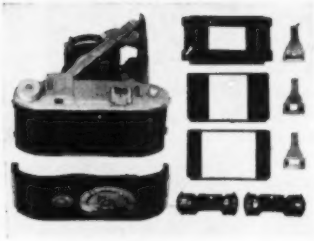


New 300-watt slide projector complete with quiet fan cooling—The Kodaslide Highlux III Projector has two condensers, 300-watt lamp, Kodak Projection Ektanon Lens *f*/3.5. All combine to produce extra brilliance, extra color purity throughout slide area. Fan cooling. New-type slide feeding in *top*. $56.50, including carrying case.



Versatile "flash" system (*left*) permits use of extension units, remote release. Battery-condenser power. Kodak Ektalux Flasholder only, $29.75.

Kodaslide Table Viewer 4X (*right*) enlarges slides more than four times. $49.50. Case, $15.50.



For Kodachrome shots—Kodak Tourist Adapter Kit (*left*) adapts deluxe Tourist Cameras for Kodachrome pictures. $13.25.

Kodaslide File Box holds 150 cardboard or 53 glass slides. $1.57. Kodaslide Compartment File holds even more. $3.94.

Your Kodak dealer will be glad to help you choose the right equipment for taking color pictures. Be sure to see him soon.

Prices subject to change without notice and include Federal Tax where applicable

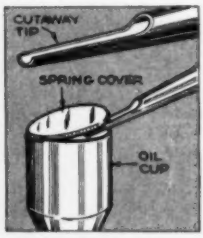
Eastman Kodak Company, Rochester 4, N. Y.

Kodak

Sliding Rack Saves Space

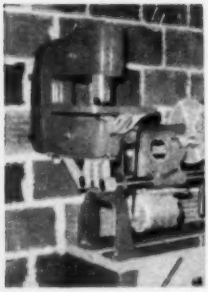
To SAVE shop space, Bill Coulter, of Columbus, Ohio, hung this small-parts rack from a track so it can be slid aside to get at other supplies behind it. It travels on two pulley wheels riding on a ¾" pipe. The jars are held by pivoted crosspieces so that they can be tilted outward.—*George Laycock, Batavia, Ohio.*

Spout Opens Oil Cups



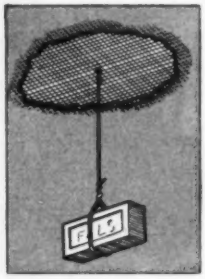
LIFTING the spring-hinge cover on oil cups to admit the spout of an oil can is often hard when there is room for only one hand. Altering the spout as shown will let you pry up the cover and fill the cup without touching a hand to it at all.—*Howard E. Moody, Upper Jay, N.Y.*

Tailstock Supports Bandsaw



I BOUGHT an extra tailstock for my Shop Smith, sawed off the top and welded on a flat plate. Now it holds my bandsaw, saving me a motor, and the single wing nut makes it easy to put on or take off the saw in a few seconds.—*Robert Gaus, Peru, Ill.*

Screen Patches Plasterboard



A LARGE hole in a plasterboard ceiling can be very hard to patch because there is nothing to back up the patching plaster. One trick that will give you a neat patch is to cut a piece of heavy screen slightly larger than the hole, stuff it up through the opening, then hang a brick or other weight from the center of the screen on a fine wire. This holds the screen in place while you plaster over it, and the wire can be clipped off close afterward.—*L. C. Ruchenbaugh, Tulsa, Okla.*

Sealer Insulates Connections

FREQUENTLY wires are soldered to connections in tight places where it is difficult to wrap them with electrical tape. In such cases, insulation in the form of asphalt-base auto-top sealer can be applied directly from the tube. It makes a tough, waterproof coating, sets in a few hours and dries overnight. —*Ken Murray, Colon, Mich.*

Clothes Hanger Holds Paint Can

A QUART can of paint can safely be hung from the rungs of a ladder with this hook made from the upper part of a wire clothes hanger. The cut ends are bent up to hook under the lip of the can from the inside. Two or more hooks like this should be bound together into one big hook if the can is larger than a quart size.

Keep the load light by packing the potato salad and the baked beans in featherweight containers that will nest when empty. Assign your spun-aluminum or plastic canisters and mixing bowls to this duty.

No fireplace? An iron skillet makes a handy fire well. Add T-hinge legs to an oven tray to form a grill. Draft can be controlled with a folding stove-top grease guard.

Corn on the cob is easier to eat if you bring along big nails as handles.

Lacking a hamper? A grocery cart with the basket lined with a plastic tablecloth will hold a lot of calories and can be wheeled from car to table. Or dig out that big covered roasting pan that never earns its keep. Either of these carryalls will hold wet bathing suits on the homeward trip.

Picnic Trappings You Can Borrow

You don't need a de luxe fitted hamper. Your kitchen shelves hold all you need to cart the chow and serve the crowd.

Eliminate sandwich-making chore by carrying a choice of spreads in racked refrigerator boxes of plastic. Then let each picnic guest stack his own favorite Dagwood.

Refrigeration is easy. Fill bottom of percolator or drip pot with ice, line coffee basket with foil to hold perishables like butter. Empty when ready to brew java.

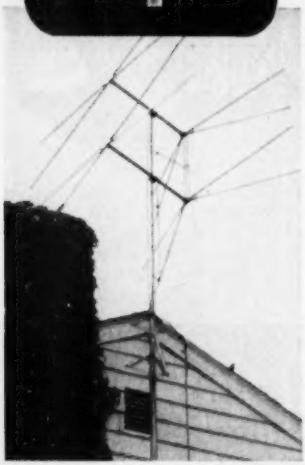
Condiment packs put flavor at every diner's elbow. To prepare them, mound a mixture of salt and pepper on squares of self-sealing waxed paper, then fold into individual packets.

Uncapping bottles can be a problem if you forget the opener. But with luck you can pry off the caps on the car bumper.

A beach table adds comfort to seashore picnics. Cut short the legs of a card table and point them so they'll dig into the sand.

Protect hamburger and steak by storing in ice-cube trays until ready to leave. Then put frozen trays and all into the insulated bags used for toting ice cream.

TV Tips



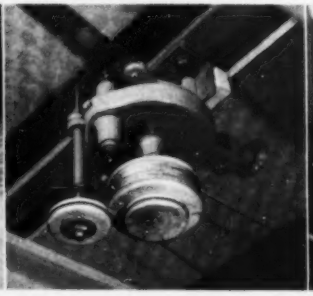
Crank in Floor Rotates TV Antenna Through Gear Drive Made from Grinder

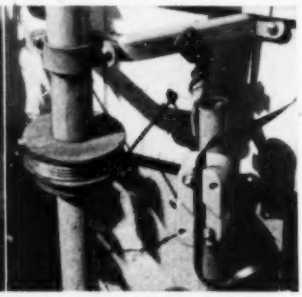
By fitting a removable crank in a small hole in the floor near his TV set, as shown at left below, B. J. Hawthorn of Hamilton Square, N. J., can slew his rooftop antenna around until it is aimed dead true at a TV transmitter. A small pointer shows the antenna's position.

The heart of the rig is a hand-powered bench grinder, mounted on its side on a basement joist almost under the TV set upstairs (center below). The grinder gears are used in reverse—the crank is connected to the small gear originally on the grinding-wheel shaft, and the antenna is linked to the large gear. This increases torque and permits fine directional adjustment.

Hardwood sheaves and ⅛" stainless cable transmit rotation between the gearbox and the base of the antenna mast, with the cable passing through holes bored in the house sill (right below). An extra spring-mounted sheave keeps the cable taut. Three stand-off brackets on the house hold the mast and are adjusted to a free-turning fit.

The pointer is belt-driven off a pulley on the underside of the cable sheave. Its shaft runs up through one of the grinder's tool-rest mounts, drilled out to serve as a bearing. The drive belt is crisscrossed to make the pointer travel in the same direction as the crank, and numbered thumbtacks are pushed into the floor at the points of best reception for different channels.

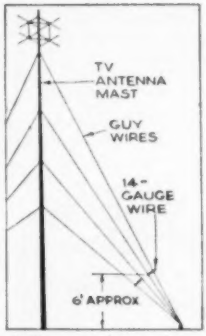




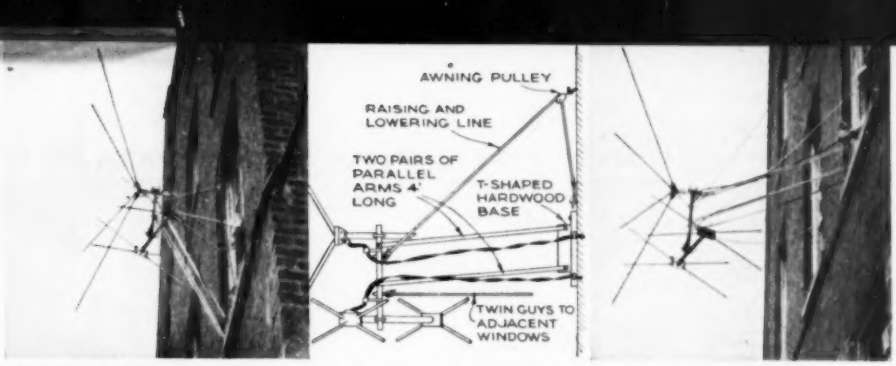
Recorder "Saves" Radio Shows

After missing many good radio programs because they came on at the same time as my TV favorites, I connected a tape recorder and clock timer to my radio. The timer turns on radio and recorder at preset times and "cans" the programs until I'm ready to listen. I also use it to catch shows I miss when I'm away from home.—*Joe E. Clark, Centralia, Ill.*

Ties Stop Guy-Wire Hum



The guy wires that support my TV antenna used to hum every time the wind blew, even after I let in a little slack. I got rid of the hum by joining each pair of guys with lengths of 14-gauge wire, twisted on tightly to prevent them from slipping down. The slight extra load breaks the rhythm of the guys and keeps them from vibrating—*P. Casperson, El Cajon, Calif.*



Window Antenna Moves Up or Down for Best TV Reception

WINDOW-MOUNTED TV antennas can be more accurately tuned to weak stations if they are raised and lowered as well as moved sideways. Standard mounts don't permit this, but you can rig up a homemade one. Two pairs of ½" aluminum tubing 4' long act as parallel arms, permitting the antenna to move up or down while remaining vertical. The arms are pivoted on bolts running through the TV mast and through the window mount, and the rig is pulled up and let down by a rope through a pulley.

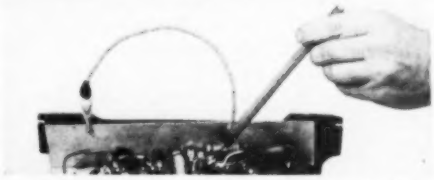
Keep Service Notes in Set

YOU'LL have no trouble finding your radio or TV service notes if you store them right inside the cabinet next to the chassis. Slip them in an envelope to keep dust off and thumbtack the envelope to the cabinet wall to prevent it from falling against hot tubes.

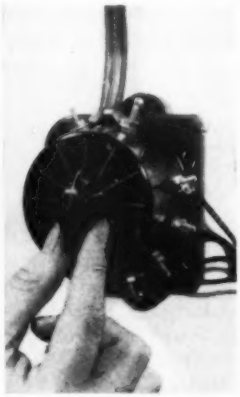
Glued Insulation Won't Fray

THE cloth covering on wire can be kept from fraying by daubing household cement on about ¼" of the cut end. The cement forms a hard coating that stops shredding, makes soldering easier and provides a neater wiring job.—*Charles Felstead, Hollywood.*

Rod Discharges Condensers

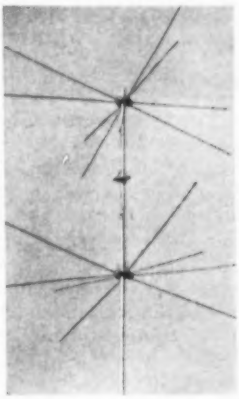


CONDENSERS in radio and TV sets often retain their charges up to several days after a set has been turned off. You can save yourself a healthy shock by using a homemade grounding rod like this before touching any of the parts. The rod consists of a nail in a small dowel connected to a length of flexible wire. The wire is attached to the chassis with an alligator clip. Touching the nail to the set wiring discharges the condensers through the chassis ground.

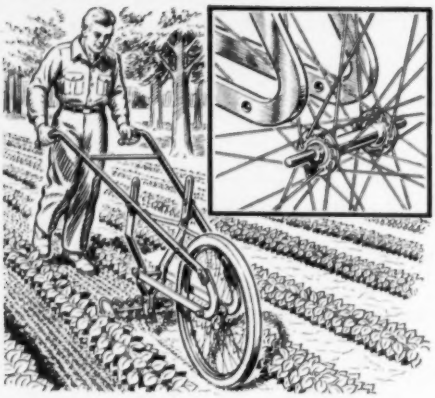


Switch Tunes TV Antenna

YOU can tune this new TV antenna to any one of nine separate stations by simply turning a switch. The switch, connected to the antenna by a four-conductor cable, selects various combinations of the 16 elements, providing the best combination for each channel. The antenna is said to be 10 times more powerful than stacked 10-element yagis and to eliminate rotating motors and extend fringe-area reception up to 40 miles. All Channel Antenna Corp., 70-07 Queens Blvd., Woodside 77, N.Y., makes it.

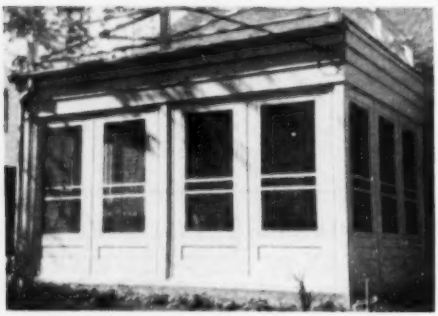


Bicycle Wheel Improves Plow



GARDEN push plows of the high-wheel type can be much lighter and easier to push by substituting an old 26" front wheel of a bicycle for the plow wheel. Such a wheel will fit many plow frames exactly. Used front wheels are not expensive but the bearings and axle should be cleaned and lubricated. Inflate the tire to about three-fourths its usual pressure and it won't be likely to injure young plants if it runs over them.—*O. S. McCaw, Lexington, Ky.*

Doors Make Convertible Porch



THE walls are doors in this low-cost porch built by Franklin Bird of Birmingham, Mich. The doors are the combination type with interchangeable glass and screen inserts. In summer, the screens are used for bug-free breezes, and in the fall it's only a 10-minute screwdriver job to switch to glass for winter warmth.

The doors are simply fitted between 4"-by-4" uprights, with strips of molding to hold them in and seal the cracks. Total cost was $550, including concrete-slab foundation, asphalt-tile floor and deck roof.

Jigsaw Shakes Drawing Ink

"STIR or shake thoroughly before use"—that's what it says on the labels of some drawing inks and the shaking job usually takes five minutes or so if the bottle has been on the shelf for some time. But here's an easy way. Fasten the bottle to the blade of a jigsaw with rubber bands or tape. Raise the blade guard as high as possible and turn the saw by hand to see that the bottle has ample clearance. Then operate the saw at low speed for a few moments and the settled pigment will be well mixed.—*Ken Murray, Colon, Mich.*

Altered Eyedroppers Shoot Glue

FOR applying a tiny drop of oil to a delicate mechanism, or shooting some glue under blistered veneer, you can't beat a five-cent eyedropper with a needle point.

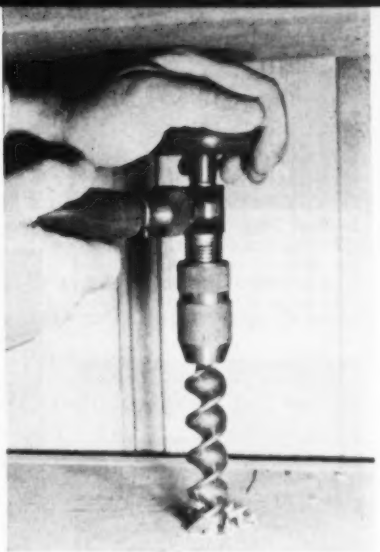
To draw the point, hold two eyedroppers together over a gas flame—the stove will do—until the tips soften. Then press them together until they stick and slowly draw them apart. The tips of both droppers will stretch out into fine tubes about as thick as a hypodermic needle. When cool, break them apart and they'll be ready for use.

TV Mast Makes Fly Rod Carrier

A LENGTH of old TV mast—obtainable at many video repair shops—is excellent as a case for fishing rods. Use a section of mast that is a few inches longer than the rod sections. Plug one end with a cork and sand the edges of the open end smooth. Insert the tubing in the cloth carrying sack. A strip of cloth wrapped spirally around the rod sections protects them from chafing when the case is being carried in a car.—*Clinton R. Hull, Costa Mesa, Calif.*

Sawed-Off Brace Gets into Tight Spots

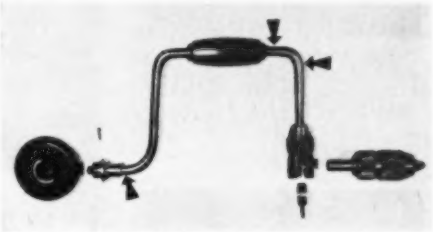
Wrist space, not elbow room, suffices to get this midget brace on the job. With special cut-down bits, its total length is little more than that of a standard full-size bit.



No more raw knuckles with this tool. It will work in a space less than 12″ high.

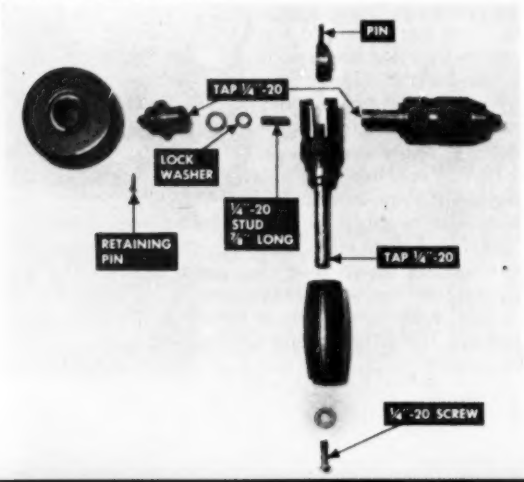
BOATS are full of tight places. That's why a marine-telephone installer, after a knuckle-skinning bout of boring a hole in such a spot, developed this sawed-off pocket brace. Give it 12″ to get into, and it can bore its way out.

To put one like it in your own tool kit, buy an inexpensive ratchet brace, take it apart, saw the frame as shown, and reassemble the pieces. The photos show steps in the conversion. Pick out a set of bits to go with the brace, cut the shanks short, and file the ends to a square taper.—*Elbert Robberson, Port Washington, N.Y.*



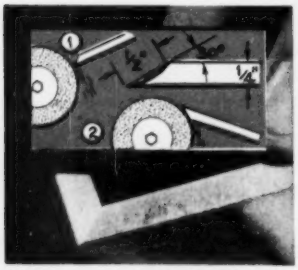
Take it apart. Remove chuck by knocking out the pin that goes through ratchet wheel and shaft. Unscrew the wooden hand pad after removing the pins or screws that lock it (do this over a pan to keep loose bearing balls from being lost). Saw apart frame in three places (arrows). Discard bent sections. Pull off handle retainer and save handle.

File cut ends and shaft end true, carefully locate centers, drill No. 7 to ½″ depth, and tap ¼″-20, finishing with bottoming tap. Slip chuck shaft and ratchet wheel into the lever, with the stop pin in the pawl collar toward the chuck. Align holes in shaft and ratchet wheel and drive in pin that locks them. Cut the head off a ¼″-20 steel screw to make the stud.

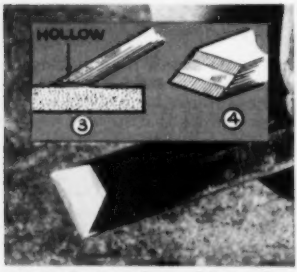


Screw stud tightly into the chuck shaft, put on the lock washer and screw the hand-pad bearing securely onto the stud. With balls in place, screw the pad back on and insert its retaining pin. Hold the crank handle on with a machine screw. If part of the hand pad is sawed off as shown by dotted line, holes can be bored close to walls or in corners.

Nicked edge is sure sign that grinding is needed. Chisel above has edge out of square and bevel is flat. It needs complete going over to produce keen edge necessary for good work.



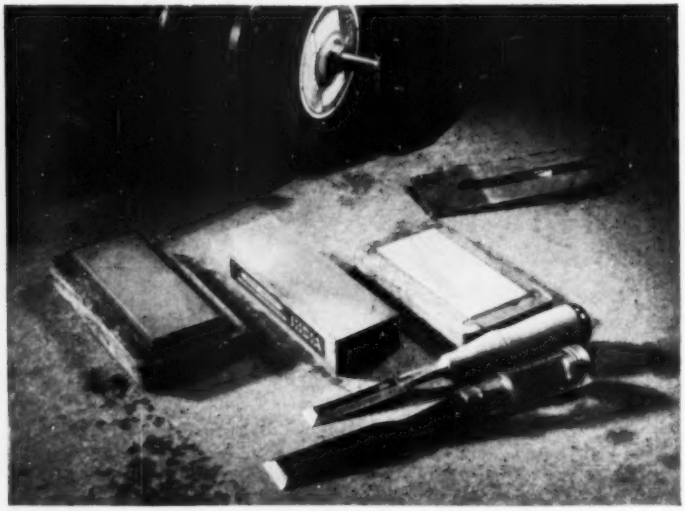
Nicks are removed and edge squared with sides by touching it lightly against the wheel (1). Then bevel is ground to about a 30° angle, or twice the blade thickness (2).



Slight hollow formed by radius of wheel helps sharpen edge with a minimum of whetting (3). Flat surfaces produced by stone grow broader after several whettings (4), until . . .

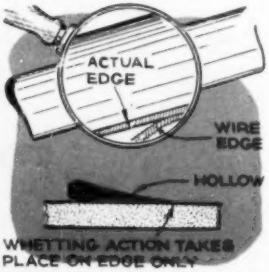
Hollow is whetted out and entire bevel becomes flat. In this condition it is difficult to feel the contact of the bevel on the stone and regrinding is needed to restore the hollow.

How to Put an Edge



IT IS surprising with what pluck a dull plane will chew into soft pine. But let it chatter along curly maple or skate on the glassiness of slash-grained fir and the necessity of a keen edge won't be doubted. Equally, an obstinate chisel, conditioned with grinder and oilstone, suddenly becomes cooperative.

Sharpening takes time, but it saves time in the end since work is more quickly done with well-edged tools. The chore is not difficult either. Next time you go in for a "once over lightly," watch the barber put his razor in shape. The razor is factory ground so that the blade is hollow on both sides. All the barber has to do is rub—first on a coarse stone to remove the nicks; then on a fine stone until a very fine wire edge turns up. This is really a burr that breaks off as the actual edge is honed so thin that it can no longer support it. The last trace of the wire edge is taken off with a leather strop and the razor is ready for Bluebeard himself.



Sharpening plane irons and chisels is done in much the same manner, except that you must grind the bevel edge hollow from time to time. The fundamentals of sharpening are condensed in the four photographs at the left. The pictures on the following three pages show the process in detail, taking you step by step through the grinding and whetting operations.

on Cutting Tools

By Edwin M. Love

Dull tools can put you on edge when you're working on a project. Smooth your steps by starting the job with well-sharpened tools.

GRINDING IS FIRST STEP

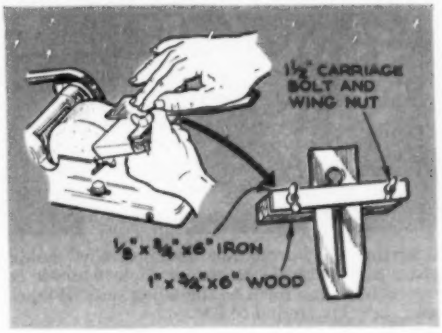
Bench grinder, left, mounted on pedestal, is all-around grinding tool for small shop. Equipped with coarse and fine wheels, it does fast rough grinding and smooth finished work.

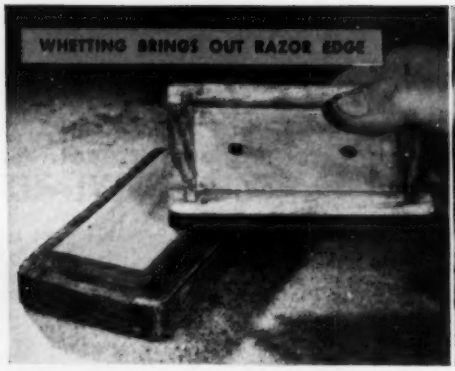
Wet grinder, right, cuts slower but won't burn edge. Water is carried up to tool in steady flow to carry off heat of grinding, eliminating necessity of dipping tool frequently.

Jerry-built grinder will serve for occasional grinding jobs. Arbor on 1,725-r.p.m. motor drives wheel at less than half the recommended speed, giving a grinding action that is mild but safe. Motor and drill-press vise holding hardboard tool rest are clamped to bench top.

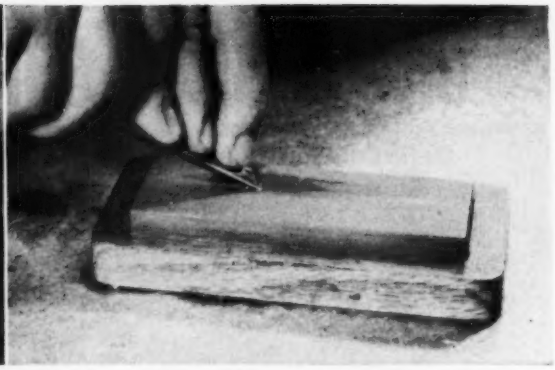
Jar of water is necessary to keep tool cool while grinding. If edge does burn, all blue area must be ground away by holding tool radial to wheel. Blue indicates temper is lost.

Broad edge of plane iron is accurately guided across face of wheel by simple jig clamped at proper distance from edge. Jig can also be used with chisels or spokeshave blades.





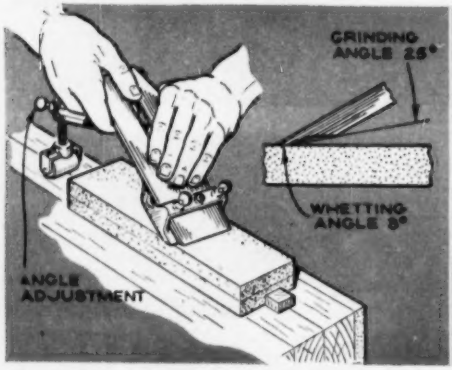
Whetstones must be held somehow to keep them from sliding. Stone holders above have pointed brads projecting from four corners to dig into bench top and hold stone in place.



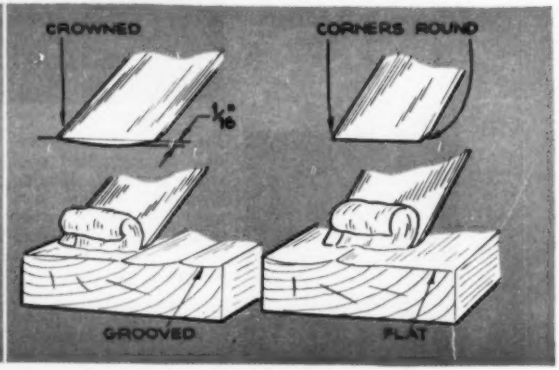
Bevel is passed over carborundum or India stone kept wet with kerosene to bring out flats on hollow surface. Straight, back-and-forth strokes are recommended.

Tool is stropped by slapping it on heel of hand, using downward and backward motion. A strip of leather tacked to a block of wood also makes an effective strop.

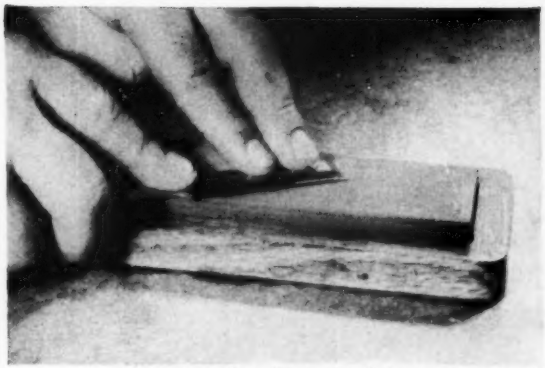
Final test of sharpness is made on hairs on back of hand. Truly sharp edge should shave hairs with ease. If it doesn't, more time on the hard Arkansas stone is indicated.



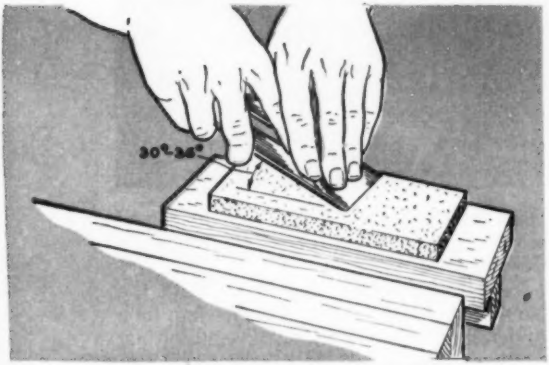
Whetting jig, available commercially, holds plane iron or chisel at proper angle while it is moved back and forth on the whetstone. If jig is used, bevel is ground to 25°.



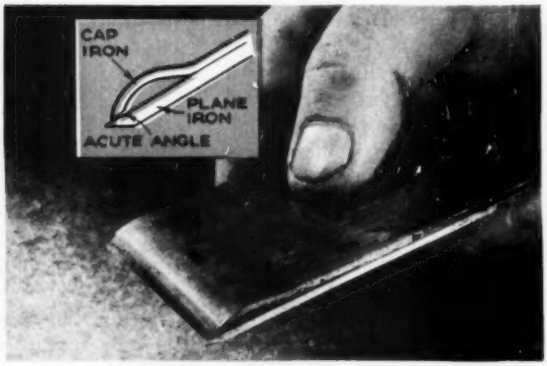
Crowned plane iron, used in jack plane for roughing, is formed by swiveling blade slightly when grinding and whetting. Straight edge has corners whetted off to blend shavings.



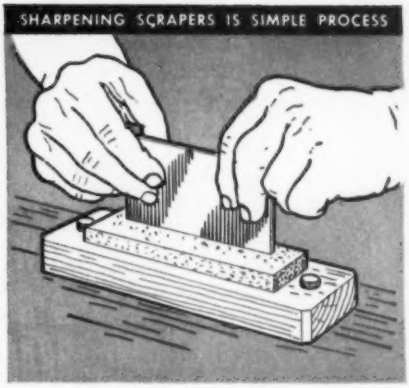
Back of tool is then rubbed flat on stone until fine burr appears along cutting edge. Burr is taken off by alternately whetting bevel and back of tool on hard Arkansas stone.



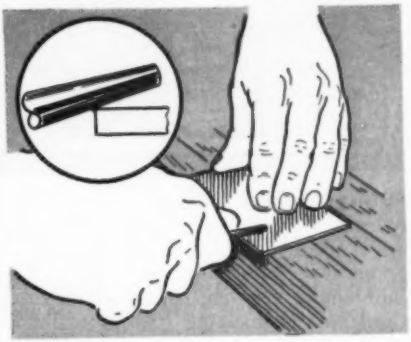
Plane iron is sharpened in same manner as chisel. Rule-of-thumb for bevel angle is to make bevel twice the thickness of blade. Therefore, 1/16" blade should have ⅛" bevel.



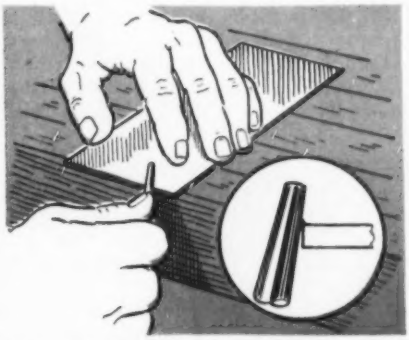
Plane-iron cap must be a snug fit on surface of blade, or shavings will wedge themselves under it. Whetting the underside to an acute bevel will make it lie flat.



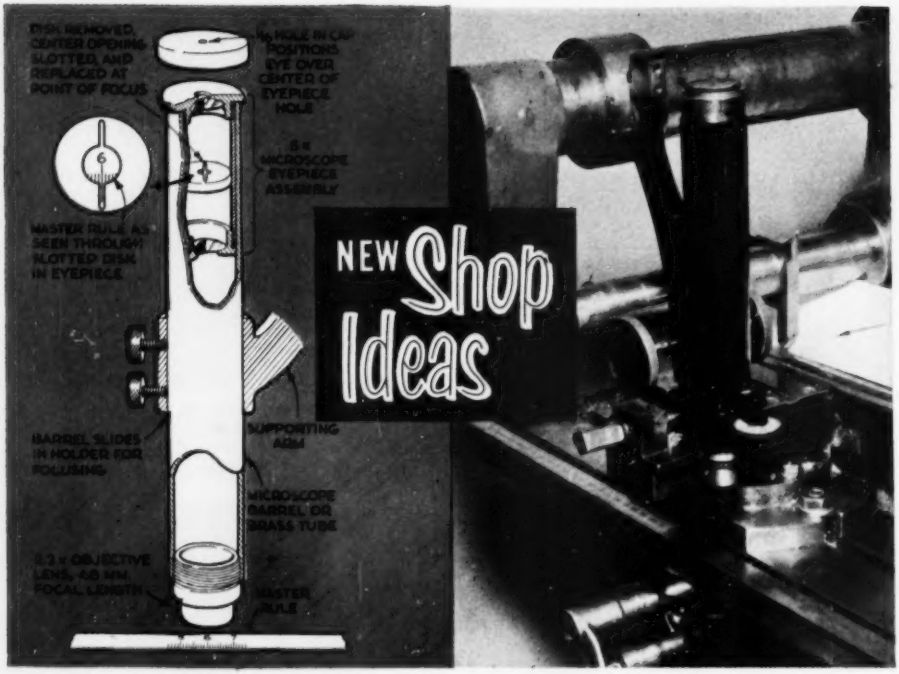
Cabinet scrapers take up where plane leaves off to put super-smooth finish on wood. First step in sharpening is to file all edges square and hone them smooth.



Edge is drawn by stroking firmly with hard, polished tool such as nailset, burnisher or rounded chisel. This removes burr and draws out a fine edge (inset).



Drawn edge is turned over by running burnisher vertically along it. A second stroke is made with the burnisher inclined slightly, and a keen, fine burr will be felt. This is the cutting edge.



Ruling Special Scales. When building special scientific or photographic equipment, you may have to mark off parts with accurate scales or calibration marks. These calibrations can be copied from metric, vernier or engineering rules; the difficulty is in accurately transferring the marks to the work. The setup above shows how you can duplicate any master rule. A milling machine is used here, but similar rigs could be fitted to a lathe or shaper.

A viewing tube, made up of parts from a low-power microscope, is mounted on the overarm, directly above the rule you wish to copy. The rule is clamped to the edge of the milling table. The part to be ruled is clamped further back on the table and scored by a V-shaped cutter bit locked on the spindle arbor.

In use, the table is advanced with the hand-feed screw, using the viewing tube to determine the amount of travel according to the graduations on the master rule. Lines are plowed out .003" to .005" deep by moving the table cross-feed under the cutter bit after each travel adjustment.

When setting up the lenses in the tube, experiment with the tube length. It should be long enough so that the magnifier is in focus when the tube is an inch or so above the master rule.—*Andrew Pfeiffer, Old Lyme, Conn.*

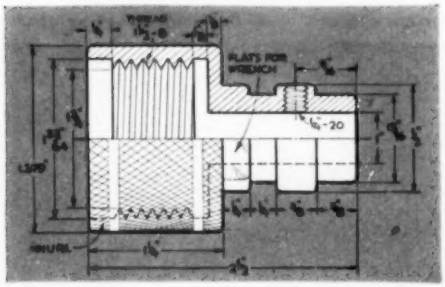
Siamese Brushes for Threads. Two toothbrushes may not clean your teeth better than one, but a pair of them joined back-to-back with rivets or machine screws will do a thorough job of removing dirt from the threads of chucks and spindles.

To clean chuck threads, just push the brushes into the opening and twist them counterclockwise, letting the threads guide the bristles up and out. Swish the brushes in kerosene to clean them.—*Clifford T. Bower, London, England.*

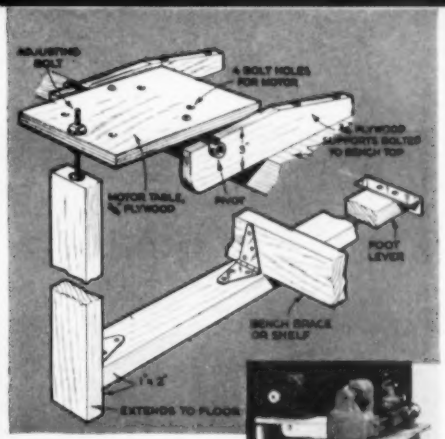
Spindle Chuck Holds Mills. A scrap of 1¾″ cold rolled is all you'll need to make this spindle chuck to hold ½″ milling cutters in the lathe. Threaded to fit the spindle threads, it will drive a cutter without slipping, and will take double-ended or extra-long cutters.

The chuck is rough-turned and knurled between centers, then held by the nose in the universal chuck (photo at left above), while the body is bored and threaded. It is then screwed onto the spindle and the nose turned to final diameter and drilled and reamed ½″ as at right above.

The wrench flats (below), are filed on the nose and a setscrew fitted to grip the cutter shanks.—*Will Thomas, Buffalo.*



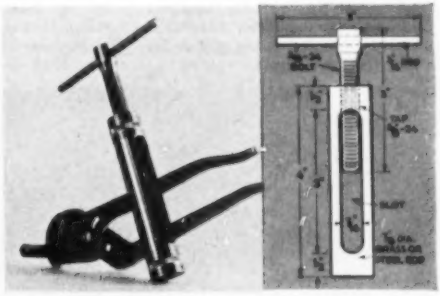
Polish as Layout Fluid. Black or brown liquid shoe polish makes good layout fluid for use on soft metals such as brass, copper and aluminum. Scribed lines show up clearly and, when the job is done, the fluid can be quickly wiped or polished off.—*Richard Schneeloch, Tulsa, Okla.*



Foot Lever Controls Lathe. This pivoting motor mount permits instant release of belt tension by means of downward pressure on a foot lever. Letting the foot lever up slowly applies power to spindle by restoring belt tension.

The 1″ by 2″ connecting strip between the lever and motor table rests on the floor in the on position. Belt tension is set by adjusting the bolt that rests on the connecting strip. Two nuts lock the adjustment.

The motor table pivots on a length of ½″ pipe that rests in two slots in the supporting boards. The motor and table can be lifted out and used on another power tool equipped with similar supports.—*Robert Hoppough, Encino, Calif.*

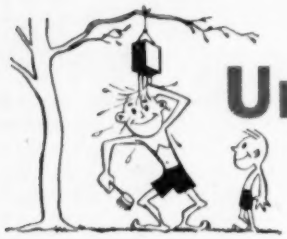


Clamp Locks Pliers. If you like to use pliers as a hand vise, this clamp will lock the work with a bulldog grip. Make the body of the clamp from brass or steel rod. Drill a series of holes and file them to form the slot. Drill and tap one end for the T-handle, a ⅜″-24 bolt drilled transversely for a short length of 3/16″ rod.—*William B. Goodrich, Somerville, Mass.*

SKILLETS and other cooking utensils can be made by cutting out lower sections of cans with tin snips. Nail on a wooden handle.

CANVAS COVER adds to usefulness of a five-gallon can. When your wife sews the cover, ask her to add a pair of carrying straps.

LIFE PRESERVERS are always good insurance anywhere around water. With the cap secured, an empty can will keep a man afloat.



Umpteen Uses for Five-Gallon Cans

FLOAT like this one for a harpoon line is easy to spot at sea. Five-gallon can also exerts considerable drag on the fish towing it.

SEA ANCHOR can be fashioned by tying can to one end of a line, filling can with water or sand and paying out line over stern.

MARKER for objects lost overboard can be made by filling can with water, tying float on end of line. Or use can as float, anchor as weight.

GRILL bacon, eggs or hamburgers like this. Cut one end out of the can, lay the can on a side and use the other side for cooking.

WITH WIRE HANDLE, can becomes a water carrier, boiler, picnic basket, clothes hamper, garbage pail. Good for washing duds in too.

BACK REST is comfortable when you fish all day from a rowboat. Can will also serve as a seat ashore or as a small table.

A pair of tin snips is about the only tool you need to turn these large economy-size cans to dozens of outdoor uses.

WHAT this country has is a good five-gallon can. Once it's empty, it just starts being useful. It can warm you, cool you, rest you, heat your food, chill your drinks, wash your socks, bake biscuits, act as a shower, let you see what's going on beneath the surface of the water, or even save your life.

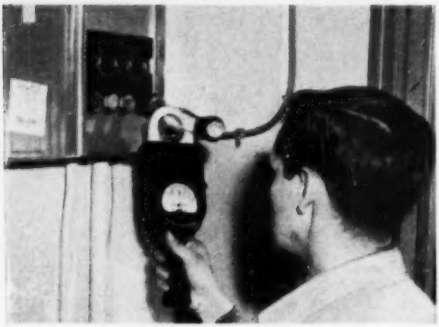
A canvas bag makes the can even handier. Perhaps a few kind words to your wife will persuade her to sew one for you.—*John Jobson, Hollywood, Calif.*

WATER GLASS is fine for surveying the bottom. Cut out one end of can and cement in a piece of glass. Slot other end for looking.

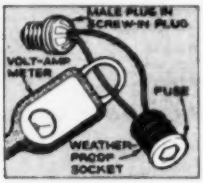
BISCUITS ANYONE? Reflector oven turns them out hot and tasty before the campfire. Cut can apart and wire shelf in place as shown.

LINE TUB is safest place to store coiled rope that may have to be paid out rapidly. Cut one end out of can with a rotary opener.

Circuit Loads Checked Easily



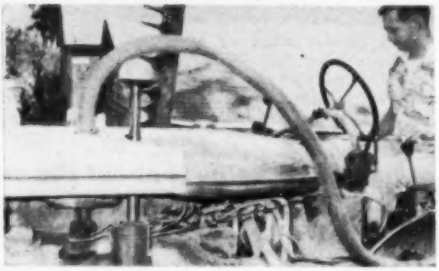
When you're testing circuit loads with a hook-on ammeter, it's necessary to pull the wires out of the fuse box to hook on the meter. You can avoid this trouble with the adapter I rigged up. It's an ordinary plug and socket wired back-to-back with short leads. The fuse is removed and inserted in the socket end, and the plug end is inserted in the regular fuse socket with a screw plug. The meter can then be hooked easily over one of the short leads without disturbing the wiring in the box. You can also check appliance loads by substituting the appliance for the fuse and plugging the other end into a wall outlet.—*Phillip M. Loveridge Jr., Feura Bush, N.Y.*



Watch Band Is Camera Strap

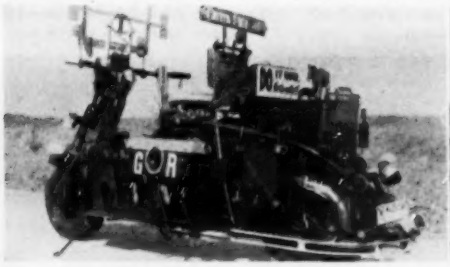
The carrying strap on a much-used camera is usually the first thing to wear out. A leather wrist-watch strap makes a quick replacement. The square wire loops are straightened, slipped through the ends of the watch strap and bent back in shape. The strap is then adjusted to the desired length.—*Tom Griberg, Moline, Ill.*

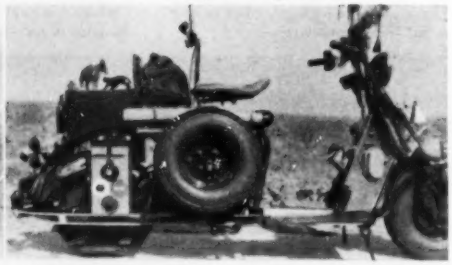
Tractor Exhaust Piped Away



This tractor operator at the University of Rhode Island doesn't have to eat his own exhaust. A flexible metal hose runs from the exhaust pipe down to a clamp on the side of the fender, carrying the fumes away from the driver's face.

No Kitchen Sink—But This Scooter Carries Everything Else





Owners who load up their cars with gadgets have plenty of room to hang them. But look what one scooter-happy rider did to his machine.

Starting with a 5-hp., two-speed Cushman, Gaston Renieri, of Chicago, first put on a center stand. When lowered this lifts the weight off the tires, and can be locked to prevent theft of the machine. Then came a toolbox with a midget pack mule and mountain lion on top "to discourage would-be second riders."

Later Renieri added turn indicators, electric bells, a gearshift lock, speedometer, clock, compass, thermometer, umbrella carrier, first-aid kit, spare gas can. A luggage carrier was made from a baby scale and the windshield from a TV safety mask.

"You can't have good engine performance without good spark plugs. So, get the best—
GET CHAMPIONS—and you, too, will be set FOR SUMMER DRIVING."

—*says* **WILBUR SHAW**, President, Indianapolis Motor Speedway and
3-Time Winner of the Indianapolis 500-Mile Race

[*Continued from page 95*]

watches the target on his scope. The blip moves into gun range—four miles. A squeeze on the firing trigger and 12½-pound high-explosive shells start firing automatically from two 11-round magazines. It's a noisy operation, with the roar of fire, the weird whirr of the hydraulic mechanism, and the slap-slap of the electric rammer that feeds in the ammo.

Shells Are Radar-Triggered

The shells themselves, as they reach the most destructive distance from the plane, are radar-triggered by a proximity fuse that explodes them automatically. And the blip disappears from the radarscope.

While the Skysweeper can be operated automatically by just the radarman, the gun carries a crew of from six to nine, including drivers, ammunition loaders, an attendant for the separate power-generator unit, a man at a periscope tied in with the computer for visual tracking and firing if the radar should fail.

There is also a portable target selector, an optical sighting device mounted on a tripod and connected to the gun by a power cable. It is manned by an officer who is the equivalent of a battery commander. If there are several planes in the sky, they all show up on the radarscope as blips. It is his job to choose a target visually and lock his instrument on it. Pushing a button then locks the radar by remote control on his selection for tracking and firing.

Mobility Is All-Important

But the most ingenious electronic devices and the most powerful atomic shells would not do much for this new artillery in a war of movement unless it had the all-important characteristic of mobility.

Where does this mobility come from? Lighter metals, more compact design, self-propelling units, more adaptable tractor units—all have played a part. The biggest factor, however, in revolutionizing artillery is the absorbing of recoil—the kickback that results when a big powder charge is used to fire a big shell.

Big guns had to be big to take up this recoil. The atomic cannon has a whopper of a kick, even though its shell is only about 11 inches in diameter. It would not be mobile, therefore not practical, if it weren't for a dual cushioning system. One is an oil cylinder with valves through which oil is squeezed to lessen the recoil thrust of the gun tube. Then a second system takes over and lets the entire weapon slide smoothly to the rear as if it were mounted on a railroad flatcar. The difference is that while a big railway gun rolls back as far as 30 or 40 feet with each shot, the atomic gun slides only a few feet.

Rifle Recoil Absorbed

An outstanding example of what absorbing recoil means in making artillery mobile is the recoilless rifle. The approach here is somewhat different. The trick is done by allowing a part of the shell-propelling blast to escape backward through openings in the breech of the gun. The force required to drive the shell through the gun tube is exactly counterbalanced by the escaping blast. If you hang one of these guns from a chain and fire it, the weapon won't swing or sway.

That principle is what has made it possible to produce powerful weapons like the 57-mm., 75-mm., and 105-mm., recoilless rifles that are so mobile they put "featherweight" field artillery actually into the hands of the infantryman. END

Enough Said

PAT and Mike, bosom friends, had a difference that could only be settled by a fist fight. They agreed that the word "enough" would end the fight. Then they went at it. Pat was floored again and again and hammered all over the place, but he groggily kept coming back for more. Finally he got his second wind and threw such a punch that Mike quickly shouted, "Enough!"

Upon which Pat exclaimed, "By golly, that's the same wurrd I've been trying to think of for an hour."—*Burns and Mixes.*

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3 h.p.*—only 32 lbs.—only $145†

PRIZE CATCH is right—here's the handiest, lightest, *full*-powered motor that ever streaked the miles past the stern of a boat! Packed in its 32 trim pounds is a brimming measure of Evinrude features, Evinrude *performance.* Not a "single," but a beautifully balanced twin—smooth, fast-starting, quiet—*the quietest of outboard motors.* And Lightwin gives you the most important of light motor advancements—Evinrude's famed Fisherman Drive! With it you can power through thick weeds and reeds—over rocks, deadheads, shallows . . . go "wherever there's water to float your boat!" SEE YOUR EVINRUDE DEALER! Look for his name under "Outboard Motors" in the yellow pages of your phone book. *Catalog free!* Write today for full-color catalog of the complete Evinrude line. EVINRUDE MOTORS, 4186 N. 27th Street, Milwaukee 16, Wisconsin.

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EVINRUDE quiet OUTBOARD MOTORS

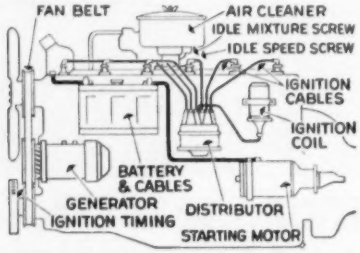
Care and Feeding of Engines

BY S. P. CORP

HOW TO TUNE UP YOUR ENGINE

Every engine needs a periodic tune-up. Here is a list of operations to check:

BATTERY: Tune-up starts with the battery which should test from half to full charge. See that cables are tight and connections clean.



SPARK PLUGS should be removed, cleaned, and inspected. Replace any which are defective. Check gaps to car manufacturer's specifications. Use new gaskets.

COMPRESSION: While plugs are out, use a pressure gauge to check compression of each cylinder. Sticky valves and defective piston rings will be revealed by this test. Such conditions must be corrected if your engine is to perform satisfactorily. If compression is up to standard, make these other tune-up checks:

DISTRIBUTOR: Check ignition points to see that they are clean and offer no resistance to current flow. Check distributor cap, rotor, and wires for cracks, corrosion, or damage. For peak economy time the engine for the gasoline used.

CARBURETOR: There is an idle mixture adjusting screw on the lower side of the carburetor—two screws if it is a dual-throat carburetor. Connect a vacuum gauge to the intake manifold and adjust the mixture to obtain a reading of 18-20 in. Set throttle stop screw so car will travel not less than 8 to 10 miles per hour.

AIR CLEANER: Clean the air cleaner on top of the carburetor and refill to indicated oil level with same grade of oil used in your engine. While cleaner is off, inspect choke valve to be sure it is free. Also make sure manifold heat control valve is free, as required for smooth and economical operation.

All this may sound like a lot of work, but it's mighty important if you want peak performance!

IT'S TIME TO RE-RING

When you need new rings, install Sealed Power KromeX Ring Sets for maximum power, long wear, and oil economy. Sealed Power chrome rings are used by 23 leading engine builders. Write for free manual on car care, "MORE POWER, Less Oil, Less Gas." Address Sealed Power, Dept. H-5, Muskegon, Michigan.

Last Night My Car Was Stolen

[Continued from page 119]

A second ignition switch can throw this fellow for a loss. Install it in the glove compartment, under the dash or in some other inconspicuous place. A valve in the fuel line may stop a thief. Mount a control on or near the dash and provide it with a lock. Removing some essential part is also a good idea—for instance, the rotor distributor.

Parking lots may present an unsuspected threat. A dishonest attendant can have copies made of your keys. He may get your address from documents left in the glove compartment. He or a confederate can drop around later and make off with the car very easily. So don't keep your address in your car.

If your car is delivered to your door by a garage attendant, don't let him leave it on the street with the keys over the sun visor.

Records You Should Keep

If you keep the car in your own garage, see to it that the garage-door lock is strong and that the car is locked. Use hinges with nonremovable pins and mount the leaves between doors and casing. It's wise to keep one copy of your car's description in your wallet, another in your home, a third where you work.

This will save precious minutes while the thief is trying to make his getaway. This record should state the year, make, model and color of your car, the license number, the engine and body serial numbers, the tire numbers and the serial number of the radio.

Include any identifying marks which the car may have—for example, dent in front left fender, outside, two inches above edge of bumper. In one FBI case, a car owner was able to supply 14 such marks. This led to the smashing of a three-state car-theft ring. END

One Sure Thing

WHEN a woman says, "I'll be ready in a minute," you can be sure of one thing—she speaks English.—*The Wyatt Way.*

Listen–12 years old and she "runs like new"!

Naturally a car may need replacement parts in that period of time ...but not as often when you insist on GENUINE FORD PARTS!

They're made right to fit right because they're made by the same men who made the original parts for your Ford—so they're naturally the *best* parts you can buy for it. And because they're made right to *fit* right, they're easy to install—save you valuable repair time.

They're Track Tested and proved by Ford engineers, using Ford cars and trucks on Ford test tracks in Dearborn and Arizona. These tests prove that Genuine Ford Parts are built to *take it!* And remember, they're easy to get. Just stop in where you see this famous blue sign.

Keep your Ford all Ford

A sure sign of savings

GENUINE Ford PARTS

Available at all Ford Dealers and selected independent garages where you see this sign.

Now you can afford the best!

Porter-Cable
Quality Electric Tools

New
Electric One-Man
CHAIN SAW

Model 110
14" Cutter Bar

Only $99.50

NEW in every respect to provide the *finest, lowest-priced* chain saw you can buy—anywhere! . . .

New Quality Construction — Equipped with Oregon® Chipper Chain—finest made. Rust-resistant hard-chromed teeth stay sharp twice as long. Heavy-duty precision ball bearings throughout. Oversized worm gears. Special steel alloy chain sprocket.

New Advanced Design — Exclusive V-shape gives greater leverage—keeps chain off ground when saw is at rest.

Ideal for cutting cord and pulpwood. Zips through hard or soft, wet or dry wood.

New Sawing Ease — Exceptionally light (only 18 lbs.)—can be operated in any position on the ground or in a tree. Saw *pulls* itself into the wood. You can saw much longer—with less effort, less fatigue.

New Versatility — Cuts everything from saplings to 28" trees. Use it for undercutting, bucking, flush cutting, notching, felling, limbing topping.

Clearing lots made easy. Two portable generators—AC or DC—available for field work.

New Safety — Specially designed log-gripping teeth grip firmly—prevent saw's bucking or jumping—eliminate pull to left or right.

New Power — Plenty of power for the toughest cutting. Husky 115 V. Universal motor operates on standard AC or DC outlet.

Light and compact—safe and easy to use in high places.

New Economy — Easy to start—inexpensive to run—nothing to get out of order. Never before a quality electric chain saw at a price so low!

See this remarkable new Chain Saw at your Porter-Cable dealer's. Or, mail coupon today for complete information.

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Send free descriptive folder on your new Model 110 Chain Saw ... also name of nearest dealer.

Name .....

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Street .....

City..... Zone.... State.....

In Canada write: Strongridge, Ltd., London, Ont.

How They're Closing In on Polio

[*Continued from page 140*]

That is why every mother and father must heed the warning signs: sore throat, a head cold, nausea and vomiting, fever, diarrhea, or sometimes constipation, loss of appetite, pain, particularly in the arms and leg muscles, and stiffness of the neck or back.

Tonsillectomy Risky in Polio Season

The latest research confirms the theory that the chance of polio is increased by the removal of tonsils and adenoids during the polio season. Also, some scientists believe there is a link between the susceptibility to polio and the shots given to protect children against diphtheria and whooping cough. Shots can be given and tonsils and adenoids removed during the times when there is little or no polio in the neighborhood.

Infantile paralysis kills about five percent of its victims. But new methods of treatment and faster and more accurate diagnosis are rapidly increasing the chance to live. Latest respirators and iron lungs are better than those models used 10 years ago. The reliable but awkward tank respirator has been replaced in many cases by a small, comfortable cylinder respirator, or even by a lightweight plastic chest respirator, which gives the patient a wider range of movement.

Electronic Device Aids Breathing

At the Harvard School of Public Health, where the iron lung was first developed, scientists have constructed an electronic breathing device, known as the Electro-Phrenic-Respirator. A hollow needle containing a copper wire is attached to the phrenic nerve, in the side of the patient's neck, which serves both lungs and diaphragm. When the current goes on, the nerve is stimulated and causes the diaphragm to contract and draw air into the lungs. The current is then decreased automatically, relaxing the diaphragm and forcing out air.

When paralysis or crippling follows

[*Continued on page 234*]

Here's a job you can do yourself

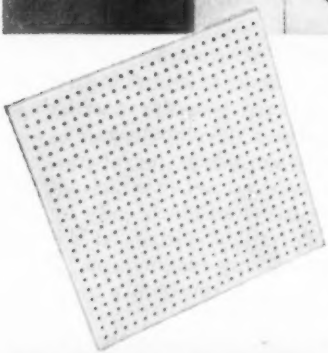
ADD "QUIET" TO YOUR HOME

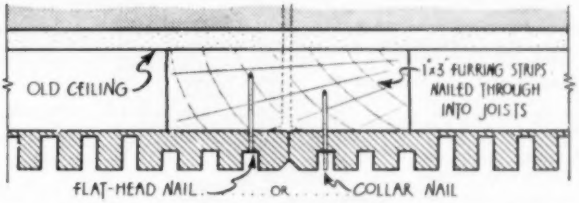
with Armstrong's Cushiontone

Your whole house will be quieter when you've installed ceilings of Armstrong's Cushiontone in your noisiest rooms. This low-cost tile is the same material used to stop noise in radio stations, restaurants, and theatres.

Cushiontone is a wood fiber material drilled with hundreds of tiny perforations. These holes actually soak up sound so it can't bounce around the room and become disturbing. Cushiontone's smoothly painted surface makes a handsome ceiling, too. It can be repainted without loss of acoustical efficiency. You'll find the 12"x12" tiles easy to install—either by nailing to wood strips or cementing right to the old ceiling.

Your lumber dealer will give you full details on Armstrong's Cushiontone. For your free booklet describing this sound-absorbing material, write to the Armstrong Cork Company, 9205 Stevens Street, Lancaster, Penna.





Apply Cushiontone over 1" x 3" furring strips nailed to the old ceiling. Nail through the shallow-drilled holes at corners. Flat-head nails, if used, are set. Collar nails are driven flush with surface of tile. Start nails before positioning tile.

ARMSTRONG'S BUILDING MATERIALS

Temlok® • M-67 Monowall® • Cushiontone® • Insulating Wool • Hardboards

Power-Full
helps for you from Millers Falls

New ¼-Inch Pistol-Grip Drill

The biggest ¼" drill value ever offered. Power-packed, rugged, dependable. Wide line of accessories for polishing, grinding, cleaning and many other uses

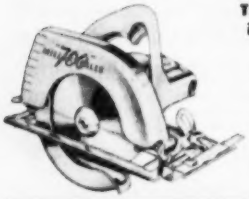
Shown above as No. 1814 with Jacobs Geared Key Chuck—$22.35

No. 814 $19.85 with Millers Falls Precision Chuck

Most Powerful ½" Utility Drill Made

The last word in design for men who want full ½" drilling capacity in steel. A real husky — yet weighs only 8 lbs. Ideal for farmers, home craftsmen, repair and service men.

No. 912 $40.95 with Jacobs Geared Key Chuck



The Biggest Buy in Saws Today

Compact, easy-to-use, safe — this 7" beauty will handle 90% of all sawing jobs. 2⅜" capacity — cuts finished 2x4's at 45° mitre. Full ½ h.p. Weighs only 11 lbs.

No. 700 $67.95 complete with depth and angle attachment

No. 966 Sander-Polisher

Most Versatile Tool You Can Own

It buffs, sands, grinds, polishes, waxes, wire brushes, drills, mixes paints. And, it's the only disc sander-polisher with an orbital attachment for fine-finish sanding.

with 6" rubber pad, 6" lamb's wool bonnet, three 6" sanding discs. $37.50

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The Mark of Superiority

Send for free Electric Tool Folder

MILLERS FALLS CO. Greenfield, Mass.

How They're Closing In on Polio

[*Continued from page 232*]

polio, delicate surgery often can correct this disability. Strong muscles can be transplanted to take over the job of weakened ones unable to carry on their work. Weak joints can be treated so that useless legs can again bear weight. When necessary, legs can be slowed in their growth or shortened by surgery to match the polio-shortened limb.

Operation Controls Bone Growth

A simple operation in which growth in one leg can be halted until a short leg can catch up with it is performed by Dr. William T. Green and Dr. Thomas Gucker III, of the Children's Hospital, Boston. Small sections of thigh or leg bone containing cartilage are removed, then grafted back on the leg bone. The graft serves as a clamp, checking the bone's growth.

When paralysis is present, polio specialists depend on physical therapy, heat, water, massage and electricity to keep the muscles healthy while waiting for injured nerves to recover. So far, there is no drug, chemical or antibiotic that will cure polio. The men whose job it is to search for the ideal drug have some hopeful leads. But they still say: "Not yet."

Rehabilitation for Crippled Victims

But they are doing a lot to rehabilitate crippled victims. For example, the remaining healthy muscle fibers in the arms and legs affected by polio must be exercised for proper development. For this, doctors now are using special progressive resistance exercises in which all the muscles are exercised electrically by means of a single pulley system. At the same time, a cathode-ray oscillograph (a writing device) records the child's muscle potentials on a graph.

Polio may cripple and deform the patient's personality, just as it cripples his body. Polio virus rarely if ever affects the patient's mind, but an embittered, sick child may develop a personality mal-

[*Continued on page 236*]

GOOD NEWS! THIS BEAUTIFUL VINYL-PLASTIC TILE FLOORING RESISTS GREASE, ACID, ALKALI YET COSTS YOU LESS!

MATICO ARISTOFLEX

The New Low-Cost Tile Flooring Made of Vinyl—The Wonder Plastic!

Costs Less To Begin With! Aristoflex—in economical standard gauge — is produced especially by MATICO to meet the needs of homeowners everywhere. It resists dirt, grease, acid and alkali... stays sparkling clean with occasional damp moppings... is quiet and comfortable underfoot . . . comes in 13 radiant Coronation Colors . . . lasts for years and years. Best of all, Aristoflex costs less than any other flooring of comparable quality . . . gives you far more for your money. See Aristoflex at your friendly MATICO dealer — he's listed in your local classified telephone directory!

install ARISTOFLEX yourself SAVE STILL MORE!

Yes, you can save $25, $30 or more on every room by installing Aristoflex yourself. It's easy, too, with MATICO's tested install-it-yourself method—special tool kit—and illustrated instruction booklet. And you can install Aristoflex in any room from basement to attic because it's rugged vinyl-plastic throughout — there's no felt backing to wear off or deteriorate.

QUALITY CONTROLLED MA-TI-CO TILE FLOORING Guaranteed by Good Housekeeping

3C99

MASTIC TILE CORPORATION OF AMERICA
Member: Vinyl Flooring Institute
Joliet, Ill. • Long Beach, Calif.
Newburgh, N. Y.

Masonite Week-end Project

Now! Put wasted space to work! It's easy to build this efficient closet with handy slide-out drawers. An old closet, a dead-end hallway, an empty corner—build it almost anywhere. Masonite 3/16" Tempered Presdwood® will make it stronger, smoother working and longer lasting.

No splinters, no snagging of fabrics with this tough, *grainless* all-wood hardboard. Easy to cut and fit with ordinary tools. Smooth surface takes paint, enamels and holds them!

Masonite Presdwood can help you do many jobs in your spare time—and for so little! Send for complete information and free plans of linen closet. Mail today!

See your local building materials dealer for
MASONITE PRESDWOOD

A type and thickness for every job!

- **Standard Presdwood—1/8", 3/16", 1/4" and 5/16" thick.**
- **Tempered Presdwood—black or brown. 1/8", 3/16", 1/4" and 5/16" thick.**
- **Temprtile®—1/8"**
- **Duolux—both sides smooth! Standard or Tempered. 4-ft. and 5-ft. widths. 1/8" and 3/16" thick.**
- **Leatherwood—1/8"**
- **Panelwood — 3/16" and 1/4" thick.**

Better Hardboards for Better Home Projects

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"Masonite" signifies that Masonite Corporation is the source of the product

Please send me free plans No. AE-269 for linen closet and also your brochure giving more information about Masonite Presdwood.

Name.....
Address.....
City.....*Zone*.....
County.....*State*.....

How They're Closing In on Polio

[*Continued from page 234*]

adjustment that will do him greater harm than a twisted arm or leg.

Dr. Morton A. Seidenfeld, director of the psychological services of the National Foundation for Infantile Paralysis, describes a typical case:

"When a child goes to a hospital, he is entered as '*Poliomyelitis, acute.*' But that isn't his name at all. He is Johnny Jones, called 'Red' by his buddies; he's 12, and only a few hours ago, he was captain of his sand-lot baseball team, and pleased as punch because his coach, Bill Smith, said he was a natural for the big leagues. Now he's lonely, afraid, and sure he will never know the feel of a bat or a catcher's mitt again."

Handicaps Can Be Overcome

To Dr. Seidenfeld, it is just as important for the doctor and nurse to let Johnny talk about his memories, hopes and fears, as it is to give him hot packs and to bathe and feed him. At 12, Johnny is old enough to understand a frank and honest discussion of his disability. This talk will help him to adjust normally to a world in which other boys will play baseball while he, Johnny, sits in the bleachers.

Above all, Johnny must be made to see his future in terms of a keen competition in which he can be the victor if he can rise above his limitations. Almost any kind of education is open to him, almost any profession that does not call for hard physical work. In any case, his abilities are greater than his disabilities, provided he has enough courage to develop them. If this truth can be brought home to Johnny, and to other children disabled by polio, they need feel no handicap. END

Roughing It

WE ARE getting into an age of civilization when a man who says he is going to rough it for a while, means that he is going to turn his electric blanket down to medium.—*Processing Equipment News.*

Texaco Tips

on car care

How to keep your engine running cool

When your engine overheats—it means trouble. To keep it operating at the *right* temperature, see your Texaco Dealer. He will check for rust, draining and cleaning the radiator if necessary. If the fan belt or water hoses show signs of wear, they will be replaced. He will check water pump; drain cocks, gaskets and cylinder head bolts for leaks. See your Texaco Dealer—*the best friend your car ever had.*

How to get that "cushiony" ride

Here's proof of why *Marfak* gives your car top chassis protection. Rub *Marfak* with your finger —it forms a tough, fluid film and builds up a "collar" to seal out road grit and grime. And *Marfak* stays put . . . clings to bearings and points of wear.

Marfak's longer lasting protection means cushiony riding ease for 1,000 miles or more. For *Marfak* lubrication, see your Texaco Dealer.

THAT "CUSHIONY" FEELING LASTS LONGER WITH MARFAK Lubrication

TEXACO

THE TEXAS COMPANY

TEXACO DEALERS IN ALL 48 STATES

Texaco Products are also distributed in Canada and in Latin America

TUNE IN: Tuesday nights on television, the TEXACO STAR THEATER starring MILTON BERLE . . . See newspaper for time and station.

you'll be money ahead when you discover

THERE IS A DIFFERENCE IN HOUSE PAINTS!

In this age of scientific progress you are entitled to house paint on your home that provides the *maximum* in lasting beauty and protection. Sherwin-Williams makes SWP House Paint in only *one* grade . . . the best we know how to make. You benefit four ways when your home is painted with SWP . . .

1. LASTING BEAUTY—When you paint with SWP House Paint in 1953, you can expect longer lasting beauty than ever before.

2. MAXIMUM PROTECTION—Building and repair costs today are the highest in history. You want to protect the investment you have in your home. SWP House Paint will give it greater protection than ever before.

3. LOW COST-PER-YEAR—The real cost of painting your house is determined by how often you must repaint it. You will find that you have to paint *less frequently* when SWP House Paint is used.

4. ASSURANCE OF QUALITY—More homes have been painted with SWP since 1880 than any other brand of house paint. Constant research has kept SWP the world's standard of house paint quality.

Why risk disappointment when you are sure of satisfaction if SWP House Paint is used? There are substitute house paints that sell for less than SWP, but don't let that fool you! *Insist upon* SWP, and be *sure!*

Write for the free booklet, "The Truth About House Paint" . . . The Sherwin-Williams Co., 1206 Midland Building, Cleveland 1, Ohio.

Go to the store that displays this famous trademark . . .

SHERWIN-WILLIAMS HOUSE PAINT

© The Sherwin-Williams Co., Cleveland, Ohio

SHERWIN-WILLIAMS LEADS THE WORLD IN PAINT RESEARCH

His Magic Makes the World Glow

[Continued from page 157]

in the shade—bright dyes that fluoresce in daylight. He named them Neon Red, Arc Yellow, Fire Orange, Saturn Green and Signal Green, after sources of light that they resemble. A sixth color, Rocket Red, has recently been added.

Changes Short Rays to Long Ones

Neon Red is brighter than any other red because it not only reflects the red rays in the sun's spectrum, which any red does, but converts the progressively shorter rays—orange, yellow, green, blue, violet, near-ultraviolet, and ultraviolet—into long red rays. This remarkable transformation at least doubles the brilliancy of the original red. On cloudy days or at daybreak and sunset, when shorter wave lengths are predominant in daylight, Neon Red and the other daylight-fluorescent colors glow up to four times as brightly as nonfluorescent colors.

These extraordinary colors, now marketed under the trade-mark Day-Glo, first appeared in military signal panels. Joe and Dick Ward together worked out the process for dyeing the fabrics. The U. S. armed services then made the Switzer colors official for visual signaling, choosing them from among 60 other suggested materials and systems.

Millions of yards of daylight-fluorescent fabrics served the Allies brilliantly during World War II and have been widely used in the Korean war. They have appeared on air-ground recognition panels, semaphore and identification flags, location markers, airport wind socks, aerial tow targets, parachutes, emergency rescue equipment and vests for line crews at airfields.

Traps Dyes in Resins

Not long after the Japanese surrendered, Day-Glo colors began to set a good portion of the nation's clothing aglow, and since 1950 they have been appearing in print all over the world.

Along the way, Joe Switzer invented a process by which daylight-fluorescent

[Continued on page 240]

PROVED *by Unbiased Field Tests*

MIRACLE POWER

Cuts Oil Usage 33%
Adds 13% Compression

Many lubrication "aids" *claim* to help engines. Here's *proof* that Miracle Power improves lubrication. Wetmore Hodges & Associates, independent research laboratory, ran a comparative road test of two truck engines, each hauling salt and gravel (38 tons gross vehicle weight). The engine *not* using Miracle Power broke down at 33,703 miles. The engine *using* Miracle Power was still operating efficiently.

Results: Miracle Power was using 33% less oil, gave 13% greater compression, 56% more spark plug life, 49% less cylinder wear, 15% less ring wear, 100% longer fuel pump life.

Insist on Miracle Power in your gas and oil.

Because it's absorbed by metal as bread soaks up butter, Miracle Power—secret blend of petroleum super lubricants including colloidal synthetic graphite in suspension—lubricates when oil burns off.

Stops DRY STARTING Damage . . . Treats the Engine, Not the Oil!

During stops, oil drains off vital engine parts and it takes up to five minutes to pump it back after starting. Meantime, dry metal grinds against dry metal. Result: wear . . . lost power . . . repairs.

Use Miracle Power to protect engines with a breathlike lubricating film. It is not a purge—not a detergent—not a "soup-up" chemical—it treats the engine, not the oil.

Lubricates *Right* . . . from the Start

Get Miracle Power (money back guarantee) at gas stations, garages and Ford, Kaiser-Frazer, Willys and other car dealers — 75c ($1.00 in Canada)

THE AP PARTS CORPORATION — *Miracle Power Division*
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Manufacturers of:
MUFFLERS • PIPES • MIRACLE POWER • dgf 123

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LAST CHANCE TO ENTER **$1,000.00 CASH**

SYNCRO SANDER CONTEST

NOTHING TO BUY—FUN—EASY!

Write For FREE DETAILS!

Last chance to enter this different Contest—nothing to buy! WIN one of 43 cash prizes. No special mechanical-craft skill or knowledge needed. Just find Missing Words for Jingle, finish the Sentence, "I LIKE SYNCRO SANDER BECAUSE" in 15 additional words or less. Contest starts March 1—ends May 31, 1953. Enter—you may win first prize of $500 cash! Write for FREE CONTEST FOLDER. Entry Blank, Rules—or get Folder at hardware stores handling SYNCRO SANDERS! Hurry!

$1,000 Contest Folder FREE At Store Or Write!

SYNCRO ELECTRIC SANDERS

SYNCRO POWER UNITS GUARANTEED AGAINST BURN-OUT DURING YOUR OWNERSHIP OR REPLACED FREE!

SYNCRO CORPORATION
Contest Dept. G-53
Oxford - Michigan, USA

send for FREE CATALOG

America's Foremost *money-making* **MECHANICS' TOOLS**

It's easy to own the same "pay-off" tools used and endorsed by America's top-earning mechanics throughout the automotive, aviation and industrial fields! Snap-on tools help you handle every repair job faster, easier, better. And they LAST . . . pay for themselves over and over again! Start building your own tool set now with basic Snap-on units—add others any time. Genuine Snap-on tools are never sold in stores—direct to users only. Mail coupon for free catalog.

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Send me free catalog of Snap-on tools.

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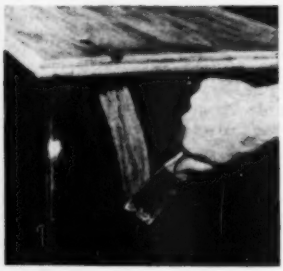
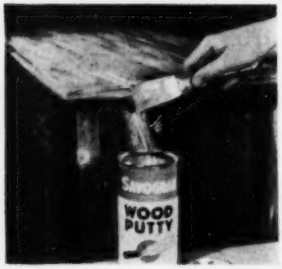
Hints on How to Refinish Furniture



Step 1. *Remove old finish*—quickly, easily, with fast-acting Strypeeze. Brush on, let it set . . . off comes the old finish. (hint: sprinkle sawdust over Strypeeze. "Roll off" sawdust, Strypeeze and old finish.)



Step 2. *Fill all holes, nicks* — permanently and simply with Savogran Wood Putty. Tools easily, won't shrink. Now, sand entire surface with 6/0 sandpaper. (For cracks in plaster, use Savogran Crack Filler. It's the original patented quick-hardening water putty.)

Step 3. *Refinish*—before you start, be sure brush is clean. Savogran Kwikeeze really cleans varnish brushes. Leaves no specks of old varnish, dirt in brush to mar finish. Apply stain, thinned shellac seal, then spar varnish or dull "rubbed effect" varnish in finishing.

SAVOGRAN

PRODUCTS . . . at better paint & hardware stores
Write for free helpful literature

SAVOGRAN CO., Dept. 33, 25 Huntington Ave., Boston 16, Mass.

His Magic Makes the World Glow

[*Continued from page 238*]

dyes are trapped in resins and made into a hard, transparent substance called an organic glass. The glass is then ground into pigment and made into paints, lacquers and inks.

Wealth has not greatly affected the lives of Joe and Bob Switzer. Bob, as befits the president of such a prosperous concern, is rather reserved and has housed his wife and three children in a stately home in a distinguished suburb. His hobbies are boating, game fishing and photography.

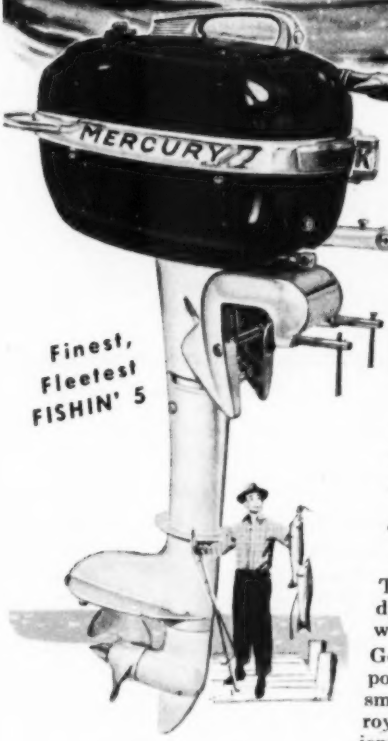
Joe, younger by 18 months, relaxes from research by singing baritone and acting in amateur theatricals. He owns a 40-acre farm in wooded country quite a long distance from the office. The approach to the house is a winding drive that climbs a ravine.

Comfort and informality mark the home's furnishings and the daily routine. Joe and his wife, the former Elise de Groot, his high-school sweetheart, preside over this relaxed community with ease and affection.

Essentially it is a kingdom for the Switzers' five lively sons, their three dogs, and a cat whose color the youngest boy calls "orange," though not Fire Orange. END

—*Boeing Magazine*

"Wasn't the big boss supposed to be on this plane?"



GO WITH THIS!

Finest, Fleetest FISHIN' 5

NEW

KIEKHAEFER

MERCURY Mark 5

with PUSH-BUTTON NEUTRAL CLUTCH

- 5 HP Alternate Twin
- 360 degree steering, Neutral Clutch
- Full weedless operation with Dual-Purpose Drive
- Superior idling for smoother, slower trolling
- Full Jeweled Power — ball and roller bearings throughout

To be sure you're there when that silvery streak of fury dynamites the surface of your favorite fishing spot . . . go with Mercury.

Go with the new Mark 5 . . . feel the smooth surging power as you open the throttle . . . throttle down to smooth hour after hour trolling. And when the battle royal starts you have all the advantage . . . the convenient new PUSH-BUTTON NEUTRAL . . . 360° steering for complete maneuverability . . . flashing speed to stay with him. And remember, your Mark 5 is "safety engineered" for your extra pleasure all season.

Write for FREE illustrated catalog, "Tomorrow's Outboard—Today" and see the new 1953 Mercurys at your dealer's. He's listed in the yellow section of your phone book. KIEKHAEFER CORPORATION, FOND DU LAC, WISCONSIN.

Features of Mercury motors are protected by issued or pending patents.

How to get more mileage out of your motoring dollar

"LIFE BLOOD" FOR YOUR BATTERY

Check battery water frequently—especially in hot weather. Batteries and conditions may vary a good deal; but to play safe, check regularly. Many modern batteries will give remarkably long, dependable service. To get the most out of yours, keep distilled water level above top of plates.

NIGHT-DRIVING SAFEGUARDS

Guard against light failure, delays and expensive roadside service by keeping spare fuses and a powerful flashlight in your glove compartment. A new fuse may make it possible to drive to the nearest garage for a check on possible shorts. The flashlight will help you locate fuse clips; may serve as emergency "headlight" if car lamps won't function.

FINEST OIL FILTER

Keep a clean oil filter on the job. Your oil filter traps engine-wrecking abrasives and sludge out of engine oil. In time, however, any filter loads up—gets so clogged it can't filter any more. *Before* that happens, put in a new Purolator* Refill. Accordion-pleated, plastic-impregnated element has up to 10 times more filtering area than ordinary filters . . . stops dirt you can't even see. Purolator Micronic* Refills come in a full range of sizes . . . cost as little as $1.60. Take just a few minutes to install.

*Reg. U.S. Pat. Off.

Check your oil filter every time you change your oil

PurOlator

World's finest OIL FILTER

Gus Takes a Gamble

[*Continued from page 180*]

him what he had found out about the car.

"Funny thing, kid. It was your windshield wiper. Kind of a joke really when a guy goes searching all over creation for the answer and comes up with something like that! You see, the flexible control cable from your dashboard button to the valve was clamped a bit short. When you shoved in the button, it didn't shut the valve completely. The wiper didn't run, but enough air was admitted to the vacuum line to lean out your mixture. And since you already had it set on the lean side, the leak caused a skip on acceleration. That's all there was to it. I should have thought of it when you told me about the car running okay in that rainstorm."

Johnny stopped in front of the garage.

"Don't say anything, kid. I know how you feel. Just go home and forget about it. Forget about trying to make all your dreams come true at once. It never happens that way. Take your time and you'll get there—the right way."

Cop Waits in Garage

Gus stepped out of the car and walked into the garage without turning around.

Inside he found a police car, and a visitor, Billy Ryan, sitting on the workbench. Gus stared at the officer worriedly.

"Hi, Gus. Thought I'd keep an eye on things until you got back."

"Busy night?" Gus asked.

"No, nothing special. Some female claims she saw someone forcing Dill's rear window. But I didn't find anything."

"Billy . . ."

"Forget it, Gus. I saw it all after the kid crawled back through that window. We'll give him another chance . . ."

"I don't think you'll regret it," Gus said. "And here, you'd better take this gun."

Billy climbed into his patrol car and started up. He paused a minute to roll down the window. "You know, Gus, you'd have made a pretty good cop, at that." END

Handle With Care

A WOMAN was mailing the old family Bible to a brother in a distant city.

Postal clerk: "Does this package contain anything breakable?"

Woman: "Only the Ten Commandments."—*The Right Hand.*

THIS COUPON

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Industrial Packaging Division
601 West 26 Street
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Enclosed my check (money order) for $2.00. Please send me postpaid, money-back guaranteed NO-RUST MIRACLE PACKAGE of VPI envelopes and paper for protecting all my metal tools and equipment.

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Address_____

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STOPS RUST ON YOUR

Hand Tools	Power Tools	Rifles	Fishing Gear	Golf Clubs
Gauges	Parts	Shot Guns	Reels & Hooks	Weaving Needles
Saws	Knives	Pistols	Marine Gear	Precision Tools

VPI*

- **SHELL OIL invented VPI**
- **MONSANTO makes VPI**
- **BERLIN & JONES brings you VPI**

Send for Berlin & Jones's big no-rust miracle package containing twenty assorted VPI envelopes—the right sizes to protect your hand tools, gauges and small parts, plus—two big 36" wide sheets of VPI coated neutral kraft paper — enough to protect two rifles *or* two shot guns, *or* an average power tool, *or* line a large tool chest and drawers.

Berlin & Jones, authoritative U. S. source for VPI, brings you these envelopes, paper, and packages to protect all of your metal equipment from rust destruction.

No oil, no grease, no goo, no dirty degreasing job, no clean-up necessary — thanks to this miracle paper which turns destructive moisture into protective VPI vapor . . . giving you years of positive protection from rust.

You get the same rust protection used by U. S. Government and leading industries in this NO-RUST Miracle Package for only $2.00. Also included is handy booklet of practical, proven VPI uses.

Money back if not completely satisfied.

*Reg. U. S. Pat. Office
Shell Development Company

Berlin & Jones
ESTABLISHED 1843

INDUSTRIAL USERS: Write on your business letterhead to our "Engineering Department" for Technical Bulletin VT-1 on volatile corrosion inhibitors, and General Bulletin GB-1, explaining new methods of cutting costs on handling and packaging of ferrous materials.

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New York 1, N. Y.

● For years Archer Pol-mer-ik has been the linseed oil chosen by more professional painters than any other for paint reducing and brush conditioning. Pol-mer-ik has been *super-treated* by a special polymerization process which reshuffles the oil molecules so they are interlocked. This gives you a tougher, more durable paint film than ordinary linseed oil. When you reduce your paints with Pol-mer-ik, they brush out easier, level out better, have a smoother, more dirt-resistant surface, and give you a longer-lasting job! Next time you paint, use Archer Pol-mer-ik Linseed Oil. You'll get better results!

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PROTECTS MOST ANYTHING

A few of the 101 HANDY USES:

- Preserves tools and handles.
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- For natural wood finishes.
- Softens stiff putty.

Yes, Archer Pol-mer-ik is a real Handy-Andy helper that saves you time and money by doing the job of a dozen specialized products. The handiest single product in your home!

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Get your copy today. Shortcuts and pointers from the "pro's" based on practical experience. Free! No obligation—just drop us a card today.
ARCHER-DANIELS-MIDLAND CO., 604 Roanoke Building, Minneapolis, Minnesota

Will This Car Cure Teen-Age Drivers?

[*Continued from page 84*]

wreck your car?" The kid's ears lighted up like a neon sign.

The worst that an eager-beaver student can do in first gear is 25-30 miles an hour. He can reach 35-40 in second. His top is 70 to 75 m.p.h.

Before Ron Corbett can qualify for a motor-vehicle examination, he has to pass his classroom test. The man immediately responsible for all this, Richard J. O'Connor, supervisor of driver education for the City of New York, says Ron's test will be at least four times as tough as any road test given by the Motor Vehicle Bureau.

He ought to know. It is 10 years now since Dick O'Connor began pleading for some sort of mechanical classroom instruction in automobile driving.

The classroom test is a film covering 27 minutes of driving. The examination covers everything, including emergency situations. What would *you* do if you swung around a blind corner to be confronted with two automobiles hogging the road and bearing down on you?

Father Was in Jeep Crash

Ron's background as a potential driver—and shame on the U.S. automobile accident record for the statement—is quite normal. His father was thrown through the windshield of a Jeep a few years ago and will carry the scars for the rest of his life. Ron himself has a newspaper clipping in his wallet describing a crash in which a chum of his and three other lads were killed last September.

A sergeant in the Air Force, his father says, "Sure, I could teach Ron to drive. But if I've got any bad driving habits, I'd only pass them on to him. Let him learn the right way. Who knows?—maybe he can teach me a thing or two." END

Natural History Quiz

Teacher: "What's a millennium?"
Pupil: "It's about the same as a centennial only it has more legs."—*Pure Oil News.*

Both Featuring AC's

THE CORVETTE, Chevrolet's sleek, low-slung sports car — and the PARISIENNE, Pontiac's exciting experimental car — are taking their bows before record crowds at every showing of General Motors' Motorama in its nation-wide tour. Both feature AC Spark Plugs.

ACs were specified to spark the performance of these special show cars — just as they are being used on more new cars than any other make. Whether your car is brand new, or several seasons old — you'll find AC Spark Plugs with patented *CORALOX* Insulators **improve gasoline mileage . . . step up acceleration . . . smooth out performance . . . increase spark plug life.** Get the benefit of the best — get ACs.

PATENTED *CORALOX* INSULATOR

AC SPARK PLUGS

Original Equipment on Nearly as Many New Cars as All Other Makes Combined

Introducing MINI-BREAKER®

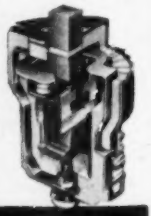
. . . the amazing new permanent "Circuit Protector" that fits like a fuse in any standard Edison base fuse socket!

No additional equipment to buy! No special wiring required!

No more fussin' with "blown out" fuses! Now you can enjoy modern permanent protection against electrical fire hazards at a new low cost simply by installing MINI-BREAKERS in your present fuse box!

SAFE, CONVENIENT, ECONOMICAL! Yes, you save many times the price of the device by being able to install them yourself. Yet, MINI-BREAKERS give you positive, pre-tested circuit protection at all times. They trip instantly on "shorts," but have a built-in time lag to handle temporary starting loads and line surges. Then, once the circuit is safe again, all you have to do to restore electrical service is press in and release the shock-proof reset button! Never need be replaced!

LISTED BY U. L.! MINI-BREAKER is a precision-built, tested and inspected "Circuit Protector" . . . the only device of its kind ever to be listed by Underwriters' Laboratories, Inc.!



• AVAILABLE IN 3 RATINGS! 15, 20, and 30 amperes for A.C. service to 125 volts maximum.

$1.50

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or send for complete information today!

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1824 River Street • Jackson, Michigan

Please rush me full details on new MINI-BREAKER today!

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

We Built a Swimming Pool for $300

[*Continued from page 165*]

time and another helped slap around the concrete inside the pool.

Dividing the labor. This worked out to four or five men on hand most of the time: two to mix, one to wheel and one to spread.

When there was a fifth man around, we could take turns resting or going to lunch without having to stop the mixer.

The man on the wheelbarrow rolled his load to the edge of the pool and dumped it over the side. The man in the pit raked and smoothed it to an estimated 4" thickness (about 6" on the bottom).

Occasionally one of us would slap the spread concrete with a shovel until we found it beginning to set up. Then we'd go over that section with shovels, pounding it into a compact and reasonably smooth mass.

Making a good joint. It is best to do the whole pool in one continuous pour. We didn't have the strength to do more than two-thirds of it the first day, so we left the unfinished edge as rough as possible to make a good joint. We also put the joint at

[*Continued on page 248*]

Bilco CELLADOOR

Make the basement of your new or remodeled home convenient, useful and livable. A BILCO door allows storage of bulky items — lets you install big equipment for workshop or rumpus room—eliminates unwanted upstairs traffic.

Replace your old-fashioned wooden cellar door with a modern, trouble-free Bilco—it costs no more.

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NEW HAVEN, CONN.

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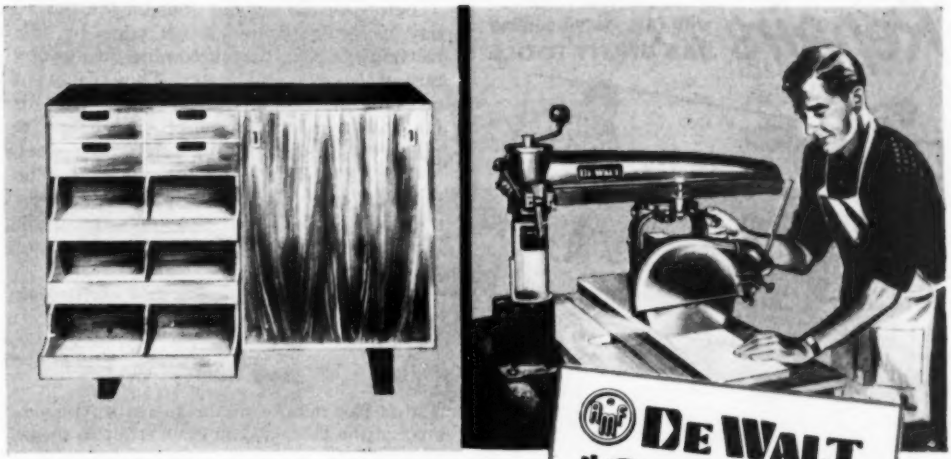


Buy this Gentleman's Wardrobe Cabinet—pay over $200. Make it yourself with DeWalt" for less than $45!

De Walt "Power Shop" makes it easy to make fine furniture yourself. And the home improvements you can make can save you hundreds of dollars.

The De Walt "Power Shop" is the new, completely modern home workshop version of the same precision machine that's been the leader among professional builders and cabinet makers for over 25 years!

FAST—Adjusts in seconds to make any desired cut! Material *always* remains flat on table.

VERSATILE—Cross-cuts, rips, miters.

ACCURATE—To professional tolerances!

SAFE—Thanks to De Walt Safety Guard!

COMPACT—Fits in 3 ft. by 3 ft.

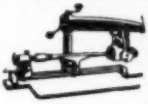
Now being demonstrated and sold at the nation's leading department stores, hardware stores and mill supply houses.

Makes all these cuts quickly...easily...expertly

IT'S A SAW
Cross-cuts, miters and rips.

IT'S A DADO
Measure-marks always visible.

IT'S A SHAPER
Straight, irregular or bevel shaping.



IT'S A LATHE
Makes wood turnings up to 34" long

IT'S A JIG SAW
Cuts out any shape —quickly, easily.

IT'S A DISC SANDER
For vertical and horizontal sanding.

and it drills, grinds, routs, joints... does everything in woodworking!

Send coupon for "Make it Yourself" Booklet!

28 fascinating pages cram-filled with facts on 20 separate pieces of furniture! How they fit into your home... cost at retail... cost to make yourself.. "do's and don'ts" of finishing. See how easy the amazing De Walt "Power Shop" makes expert woodworking!

(Modern and Outdoor Furniture)

Send 25¢ — Save Hundreds of Dollars!
De Walt Inc., Dept. PS-5, Lancaster, Pa.

Please send "Make It Yourself" booklet(s) checked below. Enclosed find _____¢ in coin @ 25¢ for each booklet checked.

☐ Early American and Juvenile furniture. [25¢]

☐ Modern and Outdoor furniture (25¢)

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Address _____

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Speed Up Home Repairs with fast, easy-handling B&D UTILITY TOOLS

Speed Up Drilling with a B&D UTILITY ¼" DRILL (only $22.95)
Drives holes to ¼" in steel, ½" in hardwood. Also drives accessories for sanding, polishing, grinding, sharpening, etc. Geared chuck model available, $24.95.

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Gives satin-like finish to furniture, woodwork, wallboard joints, pleasure boats, workshop projects... 10 times faster than hand sanding! Light, easy to use, priced below tools of comparable quality!

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Bob Davis says:

"When you're buying a tool for home repairs or the basement workshop, pick *the brand the experts choose* . . . BLACK & DECKER! You'll get real tools, not mere toys. You'll find they quickly pay for themselves in money saved by doing the work yourself. They'll give you lots of pleasure, year after year!"

Black & Decker
UTILITY PORTABLE ELECTRIC TOOLS

WRITE TODAY for *free* book giving you helpful, money-saving hints on home jobs. Address: Home Service Dept. H5S, The Black & Decker Mfg. Co., Towson 4, Maryland.

We Built a Swimming Pool for $300

[*Continued from page 246*]

the shallow end where stresses are at a minimum.

Before beginning the pour on the second day we grouted this rough edge by first wetting it down, then brooming on a soupy mix of cement and water. Then we went on with the pour. Altogether this took us 60 man-hours, plus eight man-hours to place the drain and the reinforcing steel.

Of course we weren't through then. The pool still had to have a coping around the edge and a white coat of cement for finish. But we were past the halfway mark. END

Next month: Completing and christening the pool.

Dry Humor

"LOOKS like rain," said the tourist to the old-timer at the filling station in an arid part of the West.

"I sure hope so," sighed the old man. "Not for myself," he added quickly, "but for my grandson here. I've seen rain."—*The Right Hand.*

It's a cinch to Install!

Combustioneer®
AUTOMATIC HUMIDIFIER

A few dollars, your own tools, a couple of hours will give your home all the benefits of healthful, protective *automatically humidified air!* Yes, in your *present* warm-air furnace—coal, gas or oil! No plumbing necessary!

Exclusive **Combustioneer** *features*...Twin-Valves of stainless steel, can't rust, corrode or leak . . . "Noverflow", prevents water dripping *inside* furnace . . . big "Thirsty-Thick" ceramic plates for larger water evaporation area . . . Selector Dial for positive humidity control . . . Water pan of heavy stainless steel.

Low Prices! Model CH-300, 4 plates for 13" to 20" plenum (width or length), $20. CH-200, 6 plates for 22" to 25" plenum, $22, F.O.B. Springfield, Ohio. Prices include 10 feet of tubing, saddle valve and adjustable hinge face plate. Immediate shipment. Check or Money Order. **Combustioneer DIV.**

THE STEEL PRODUCTS ENGINEERING CO.
1292 W. COLUMBIA STREET, SPRINGFIELD, OHIO

Our sunporch was no fun. It was a chilly place to sit even in May and June. Here was a considerable part of our house going to waste!

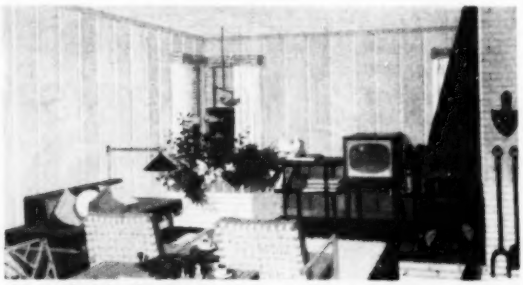
Then our dealer showed us Gold Bond Insulation Board Products, explained how we could use them to insulate...and decorate as well.

Gold Bond Insulation Planks are lightweight, easy to handle. They come in four widths and in a variegated blend of four colors.

First step was to nail furring strips to the old wall. Then we stapled on Gold Bond Insulation Board Planks. Snug, interlocking edges hid the staples.

For the ceiling we selected another Gold Bond Insulation Board Product—Acoustamatic* Tile. This gave us a smart, good-looking ceiling...with built-in sound-conditioning.

*TRADE MARK



Now...here's the quietest, most comfortable room in the house. And there was no painting or papering at all. Gold Bond Insulation Board Products come already decorated.

See Gold Bond Insulation Plank...and new Gold Bond Acoustamatic Tile...at your Gold Bond lumber and building materials dealer.

ADD-A-ROOM NOW! with Gold Bond

NATIONAL GYPSUM COMPANY
BUFFALO 2, NEW YORK

Fireproof Wallboards, Decorative Insulation Boards, Lath, Plaster, Lime, Sheathing, Roofings, Siding, Masonry Paints, Wall Paints, Textures, Rock Wool Insulation, Metal Lath and Sound Control Products.

HOW TO RECOVER CRACKED CEILINGS *in 4 Easy Steps*

1. ***Apply furring*** directly over old plaster—at right angles to joists—on 16 inch centers.

2. ***Nail Upson "Floating" Fasteners*** to furring on 16 inch centers. Fasteners eliminate face nailing.

3. ***Clinch ceiling panel*** with panel-faced block of wood. Clinch from center outward.

4. ***Apply mouldings*** where ceiling meets wall and wherever else they are desired.

All it takes is simple carpentry . . . and in a matter of hours, you have a lovely new ceiling that is forever crackproof! There's no messy replastering, no housecleaning ordeal! And no visible face nailing because Upson Kuver-Krak Panels are anchored securely from the back with patented "floating fasteners!" Other Upson Panels (plus *washable* Upson CEILING TILE) available in a variety of lengths, widths, thicknesses. Each marked for specific uses. Send 10c for 32 page idea booklet in full color; working drawings for storage wall included free.

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Quality you can trust

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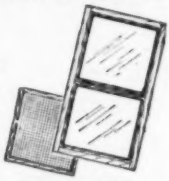
$100.00 A WEEK IN YOUR SPARE TIME!

Assemble and Install Buckeye Screen and Glass Combination STORM WINDOWS
(Glass and screen panels are interchangeable in summer and winter)
Install 10 Storm Windows—Make $100.00 Profit!



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- **Tens of Thousands Already Sold.**
- **Either Redwood or Aluminum Types.**
- **No Finer Quality Available.**

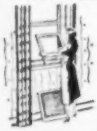
You Pay Only $6.65 for a redwood combination storm window to fit a house window 24½" x 56½" (Screening and glass not included)

Here's your golden opportunity to turn spare hours into big money! In just a few hours a day you too can make more money than you ever dreamed possible—in both summer and winter—assembling Buckeye Combination Storm Windows.

Imagine making $10.00 or more on every Buckeye Combination Storm Window you assemble and install! Yes, that's the kind of clear profit you can make. Assemble 10 windows, make $100.00 (about 7 hours time after a little experience).

This is no get-rich-quick-scheme but a legitimate, sound way for you to make additional money in your spare time. You risk nothing—no tools to buy, no big inventory needed. Just order storm windows as orders pour in.

We have been in business twenty years, sold tens of thousands of these top quality redwood or aluminum storm windows. Our reputation is your guarantee of quality.



FHA FINANCING THROUGH YOUR BANK
Yes, Buckeye Storm Windows can be financed on FHA (Federal Housing Authority). You or your customers can pay as little as $5.00 a month for these storm windows, take up to 36 months to pay! No down payment. Your local bank will be pleased to give you full information.

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J-64 64-drawers	24.95
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J-24 24-drawers	10.95
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CONTENTS VISIBLE Crystal-Clear Drawers

32-drawer Illustrated 15¼" high 12½" wide 6" deep

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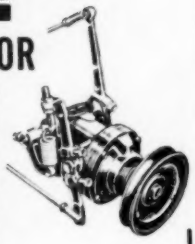

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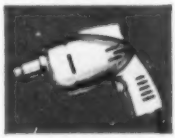
My SKIL Drill made fast work of drilling and countersinking all the holes for bolts, dowels and lacings. The SKIL Drill handles easily even in close quarters, because this drill is compact, light weight, perfectly balanced.

You'll also do sanding, polishing, buffing, brushing and grinding . . . get dozens of "bonus uses" . . . with your SKIL Home Shop Drill and SKIL accessories. Start now to save time and work by using a SKIL Home Shop Drill for all your carpentry and hobby projects. And use the coupon now to order your SKIL-Chart No. 112.

SKIL Home Shop Drill Model 549—The only ¼" drill of its power and price with preferred, sure-gripping geared chuck. Weighs only 3½ lbs., yet drills ¼" holes in steel, ½" in hardwood. Priced at only $24.95. Model 518 with popular hex-key chuck, only $22.95.



*For materials in 4 units shown. Costs vary locally. Tool prices subject to change without notice.

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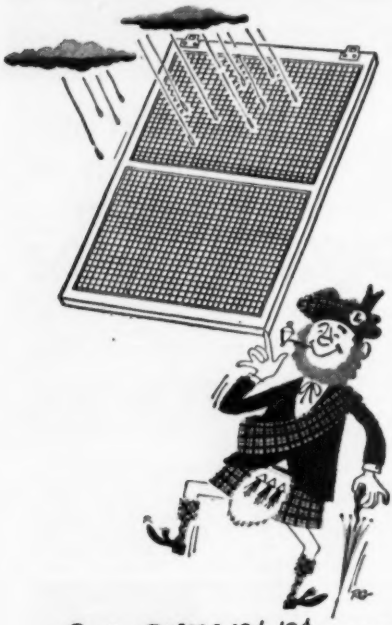

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At last, here are the first—**the only**—gear driven saw attachments to whiz thru 2x4's in one cut! Imagine, now you can build **anything** from bookcases to a bungalow with these sensational new saws. A moderately priced drill will do the job because of new "ARCO SAFECUT" Blade.

ONLY "ARCO" GIVES YOU THESE FEATURES: 5-inch Safecut Blade—cuts faster—uses 30% less power, **Graduated Depth & Bevel Gages** for cuts to 1¾"—bevels from 0 to 45°. **Adjustable Rip Gage & Visual Guide, Sturdiest and Easily Adjusted Safety-Yoke** keeps drill steady, **Worm Drive Clamp** releases drill in seconds. **Precision Gear Box with Steel Gears.**

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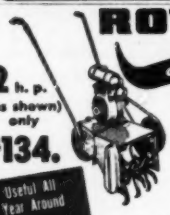

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Worcester SHEAR MASTER* Model 900

*Also made in 18" Model 750, the Worcester POWER MASTER**

Kids and grownups — male and female — they all get a thrill out of a Worcester power mower.

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AND JUNIOR! Since Dad made him responsible for taking care of the Worcester and keeping the lawn in trim, he's been proud as a peacock. And the lawn is the envy of the neighborhood.

Valuable hints on lawn care!

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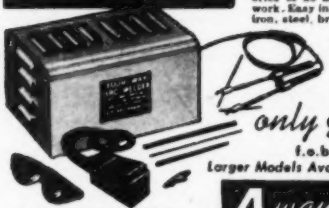

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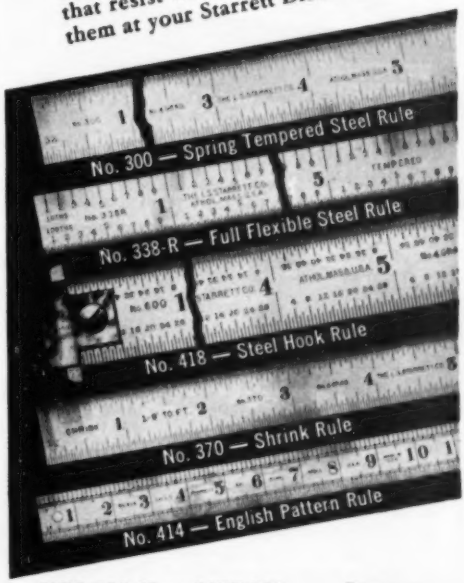

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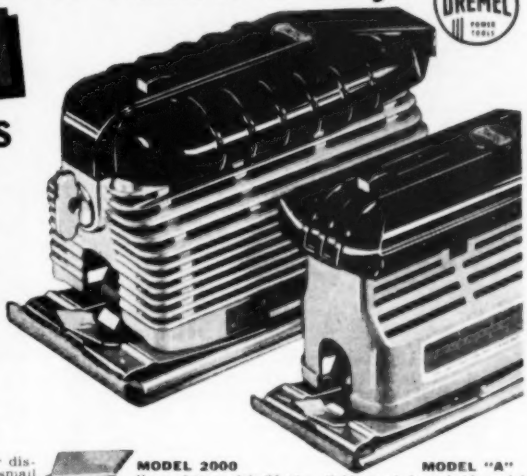

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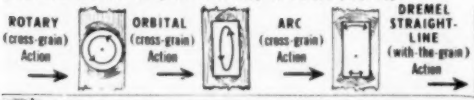

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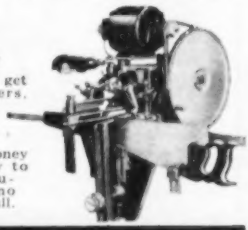

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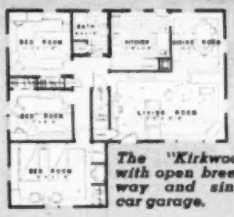

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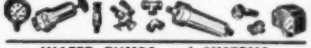

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Build loaders, diggers, presses. Save to 50%. Brand new units. • **Tractor Pump** (1000 PSI) **$45.50** • **Hand Pump, $10.50.** • **Cylinders,** 3" bore by 8" stroke, one-way, **$11.95.** • 3"x24", **$39.90,** (two way.) • 2½"x36" **$34.95** (one way.) • **Control Valves $18** (one way or two way.)

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- **1000 lb. winch** **$19.95**
- **2000 lb. winch** . . . **$29.95**
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• Engineering school closes due to high cost. Limited quantity their fine courses. Radio, **$5.95.** Electrical-radio, **$9.95.**

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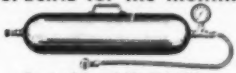

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We pay shipping charges. Send for catalog.

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Assemble Your Own

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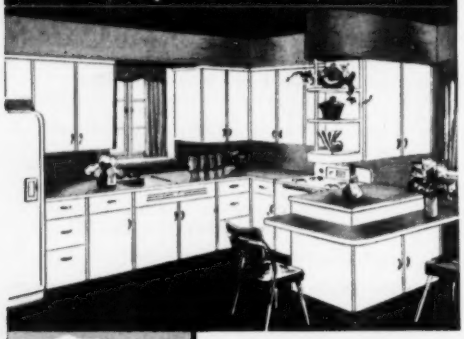
Nu-Style Wood Cabinets



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Anyone can assemble Bilt-Well Cabinets as all parts are prefitted. Cabinets fit directly to wall surface.

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Why wait to buy what you can have now by doing the assembling, the installing and the decorating yourself? Bilt-Well Nu-Style Cabinets are completely machined, pre-fitted, and ready to put together. Don't wait until you "save up" for a new kitchen, do it yourself and save. *Sold by leading Lumber Dealers.*

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THIS IS NOT A KIT

A Complete Mower Assembled As Illustrated

Model 53M Keen Mower. Add your electric motor or gas engine. Concealed blade for safety, 3 cutting heights, 1½" to 3½". Ball bearing semi-pneumatic wheels. 18" cut. Cuts to within ½" of sidewalk. Weight 48 lbs. America's Greatest Power Mower Value. Order Now.

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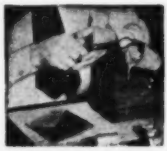

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Your Profits begin the day your store OPENS!

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My TASTEE-FREEZ STORE took in $10,437.75 the first 3 months—reports K.F.R., of Binghamton, N.Y. Mine earned over $7,500 the first 5 months, says S.S. of Lansing, Mich. *YOU CAN DO IT TOO!*

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MEN WOMEN . . . here's YOUR chance to become part of this world-wide chain of famous TASTEE-FREEZ STORES . . . to serve this delicious, nutritious frozen dairy product . . . in Cone Cups, Sundaes, Malts, Shakes, Quarts, Pints.

TASTEE-FREEZ chain of stores from coast to coast and 'round the world—uniform in design—nationally advertised and supervised but *locally owned*. If you want to cash in on the ever-growing popularity of AMERICA'S FAVORITE FROZEN DESSERT—GET THE FACTS NOW!

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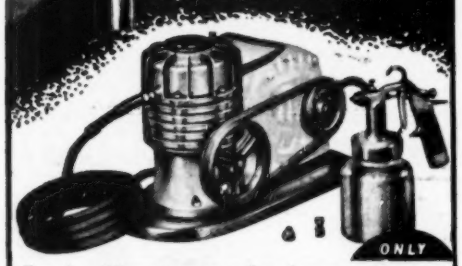
Speedy Sprayer



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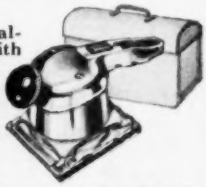
Build, repair, install, finish or refinish—at your convenience, at low cost. Powerful SpeedTools take the drudgery out of work, help you do "professional" quality work in a hurry.

No. 150 SpeedSander
An all-ball-bearing, orbital-motion, finishing sander with powerful 3450 r.p.m., A.C. induction motor and cast aluminum body. **$34.50**



150-K SpeedSander Kit
The Sander with Accessories including: deep contour pad, finishing plate, felts for free abrasives and wet rubbing, lamb's wool bonnet, 90 sheet abrasive covers, etc. in fitted steel carrying case. **$49.50**

No. 1000 SpeedSaw
¼ H.P. Universal Motor, cast aluminum housing, safety shut-off switch. Cuts all angles to 45°, any depth to 1⅛" **$29.95**

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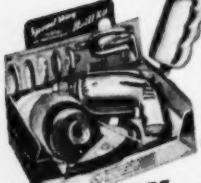
(for metal or wood)
Extra power, high speed, electric drill with cast aluminum cases, and geared chucks.

No. 200-J ¼" SpeedDrill $19.50
No. 400 ½" SpeedDrill $39.50
also other sizes, types.



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Several fast selling kits. Painters and Householders Kit (illustrated) is typical. It has: ¼" Hornet Drill, Abrasive Discs and rubber backer plate, grinding wheel, wire brush, buff, etc. In attractive display carton. **$19.95**

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USE FOR: ● Reamer Drives ● Midget Cars ● Feed Mills ● Canning Machines ● Conveyors ● Lathes ● Milling Machines ● Motor Boats ● Cream Separators ● Garden Tractors ● Pumps

Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of ¼ to 1½ H.P. This Westinghouse-Oil Gear Unit consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Shafts measure ⅝" diam., include keyway. Input gotation is counter-clockwise facing shaft. Recommended input speed not to exceed 750 R.P.M. Over-all dimensions, 7½"x7½"x11½". Gov't acquisition cost, $429.00. Ship. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago **54.50**

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Item #301 Model 125 to charge 6 and 12 volt batteries—12 volts—300 Watts; Heavy Duty Generator; Push button self-starter; Sturdy single cylinder air cooled Continental 1.3 H.P. engine; 2 qt. gasoline tank in base; Ammeter; Generator cut-out; Concealed coil, etc.; Speed and charging rate control; Attractive orange finish; Weight 93 lbs.; Length 15¼", width 11¾", Height 14¾". F.O.B. Chicago **89.00**

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200 GALLONS PER MINUTE

Brand New

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TYPICAL PERFORMANCE DATA

Suction Lift	Head Pressure	Gal. Per Min.	H.P.	R.P.M.
10'	75	260	6.0	3500
10'	65'	200	5.2	3500
10'	80'	40	1.5	2500
10'	50'	140	3.0	3500
10'	30'	100	3.0	2500

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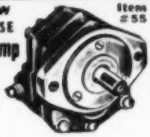

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ITEM #1036

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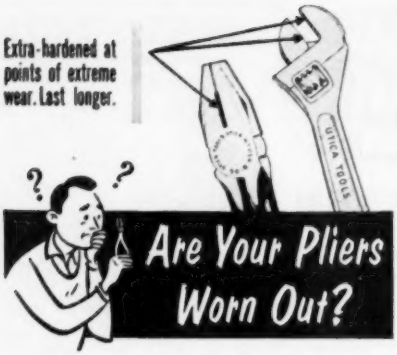

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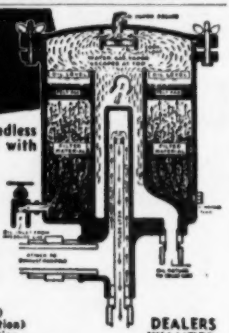

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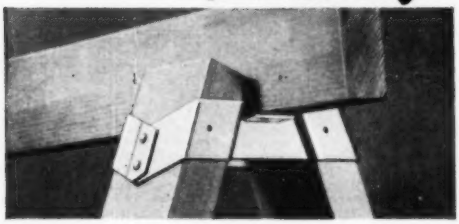

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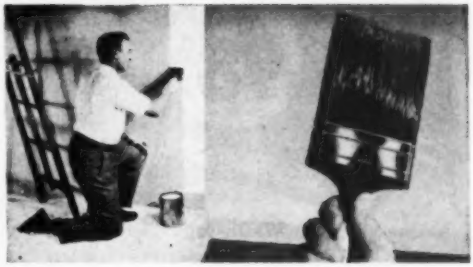
Pointers for Home Painters

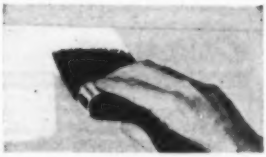


Choose the right brush for the job!

A 4" flat brush is an easy-to-work-with size for painting walls, floors, ceilings and other large, flat areas. And you'll find a brush with Du Pont nylon bristles picks up more paint per brushful . . . flows it on faster and easier.

Paint floors in areas about four feet square. Start in far corner and work toward door. For best results use wide, flat, nylon-bristled brush — one designed for the job.

With the tip of brush, work paint up to ceiling moldings and down to baseboards. Cover space two feet wide. Paint last strokes into area just painted to avoid overlap.



When painting ceilings, dip brush to one inch only. Raise quickly and use short, light strokes. Paint areas about four feet square. Don't poke or jab a large brush into corners.

For storage, clean brush with thinner, then scrub bristles on a board with warm water and cleanser. Rinse and comb bristles. Wrap in heavy paper to store.

For best results use NYLON PAINT BRUSHES

JOB AFTER JOB, you'll get best results with a well-tipped nylon paint brush. Durable Du Pont nylon bristles paint smoother . . . are clean and sanitary . . . never get brittle . . . don't break off even under the roughest treatment. And nylon bristles last from 3 to 5 times longer than ordinary bristles. Leading manufacturers make nylon paint brushes in all types and sizes. Look for the name NYLON on the handle. Be sure to pick the size brush designed for the job.

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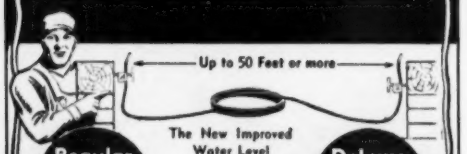

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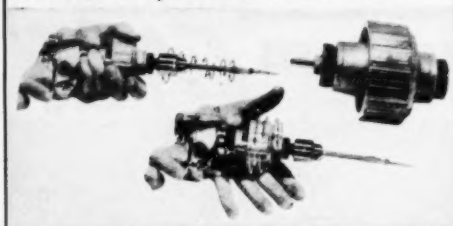

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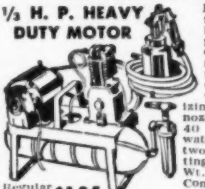

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No. 3 - Double Action Cylinder Bore is 1", Shaft 1/2", Stroke adjusts from 2-1/2" to 4" with internal sleeve stops. Length overall 8-1/2". Will take 1500 lbs continuous - 3000 lbs. intermittent. Will lift or push 1100 lbs. **5.75**

No. 42 - Double Action Cylinder. Bore is 3-1/4", Shaft 1-1/8", Stroke 9-1/8". Length 17-1/2". Lift capacity with 1500 PSI line pressure approx. 12441 lbs. **18.75**

NO. 4 - Double Action Cylinder. Bore 3", Shaft 1-1/8", Stroke 3-1/2", Length 8½". Lift capacity with 1500 PSI line pressure 10500 lbs. **18.75**

No. 53 - Double Action Cylinder. Bore is 2-3/8", shaft 1¼", stroke 15¾, length 26". Gives 6645 lbs. lift with 1500 lbs. line pressure. **20.50**

NO. 29 - Double Action Cylinder Special. Gives 20,000 lbs. lift with 1500 PSI line pressure, or will give 40,000 lbs. thrust on intermittent 3000 lb. line pressure. Has 4" bore, 1-1/2" dia. piston shaft, 19" stroke, 30-1/2" length. Ideal for presses, road, farm and shop equipment. Cost Gov't $390. **29.95**

P-1A PESCO GEAR PUMP

Capacity, 1¼ GPM at 1500 RPM at 1500 PSI. Pressure limit is 1500 PSI continuous, with intermittent maximum of 1875 PSI for 15 seconds. Normal operating speed is 3750 RPM with an intermittent maximum speed of 4500 RPM. Rotates right-hand only. **Now 8.95**

BENDIX 4-WAY VALVE

Poppet type. Off at neutral. Has pressure inlet, and return & 2 pressure outlets for operating two cylinders independently. Position of handle selects either cylinder. Can also be used with hydraulic motors. Has 1/4" internal parts with 7/16-20 thread. Overall size is 3" in diameter & 1" thickness. **6.75**

No. V-6AA MANUAL CHECK VALVE Cam Piston type. Permits free flow in one direction while checking any 'back flow' until control handle has been positioned to allow free flow in both directions. Has 1/2" tube size parts (3/4"-16 thread) **2.25**

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BENDIX HYDRAULIC PUMP AND MOTOR

Has 3½ GPM capacity at 600 PSI. Motor is 1½ HP, 24V, DC. Operates on either 12 or 32V, DC current. Has built-in relief valve adjustable to 1500 PSI. This unit ideal for bait tanks, hyd. lifts, portable loaders, etc. Cost Gov't approximately $350.00. **13.95**

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An aircraft type oil filter which can easily be adapted to autos, etc. Will keep oil clean without a cartridge replacement. Can be installed in minutes. Has two mounting braces. Line Size, 3/8" std pipe parts. A real SURPLUS BARGAIN. **6.95**

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Self contained, 2 H.P., constant torque at all speeds with variable volume reversible, piston pump (controlled by outside lever) supplying piston hydraulic motor. Automatic pressure, dash pot for smooth control. Power output RPM -0 to 1/3 input RPM in both directions. Input RPM 1800 continuous. 4000 intermittent. Dash pot can be removed for greater RPM. Ideal for lathes, duplicator set-up of mills, conveyors, small cars, drives, gearings, etc **40.00**

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Complete hydraulic pumping unit. All necessary parts assembled & ready to work at a great saving in time and cost to you. Delivers 3-1/2 GPM at 1500 PSI. (other volumes and pressures can be attained by simple adaptations) Unit consists of a gear pump driven by a 2HP, DC motor (4000 rpm max.), relief valve, pressure unloading switch, filter, accumulator, reservoir with sight gauge & complete plumbing. Mounted on 19"x 25" aluminum panel. Complete with 24V-DC motor. (Other motors of any current can be adapted) **49.95**

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Here's a unit PACKED WITH BRUTE FORCE! Does all those hard, heavy jobs that ordinary Power Tools cannot handle. Easily made from a vacuum cleaner type motor, a gear reduction drive and a few homemade parts. Can be used for turning large nuts & bolts, digging post holes, drilling large holes in wood or metal, driving power tools, & machinery, lifting, pulling, pushing, or any job where a slow speed with high take-off is required. YOU CAN'T STALL IT! Lightweight, easy to handle. Has 1000's of uses in the home, garage, shop, factory. We supply complete instructions

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Has 18-3/4" stroke at 1 to 1 ratio. 7/8" input and take-off shafts may be shortened if desired. Input shaft has universal joint. Has a threaded mount stud with spared roller bearing adaptable to swivel mount. . . **7.95**

3 SPEED TRANSMISSION

Converts a high speed, low power input into low speed, high power take-off. Has 2 take-off shafts at 4 to 1 and 16 to 1 ratios. Gear box has a worm drive, bronze gears and a throw-out clutch. Will operate in either forward or reverse directions. Adaptable to many uses on power machinery **19.95**

RIGHT ANGLE DRIVE

Has direct 1 to 1 ratio through 90° bevel gears. The drive and take-off shafts are 3/8" dia. Gears are self-lubricating, hi-speed steel. Ideal for use on power tools, flex drives, etc. Length 3-1/2", width 2-3/4" thickness 1-1/4". A Buy at **2.25**

ELECTRIC ACTUATOR

Poole Linear Actuator - has hundreds of uses for any mechanical device needing controlled two way action. Will open, close, raise or lower doors, windows, gates, etc. Has 8500 RPM, 1/6 HP series wound motor. Operates on 24 V, DC current. Gives 4-1/2" stroke in 13½ secs. Compression and tension loads up to 750 lbs. Has adjustable micro switch for limits of travel. The lgth. retracted is 11 inches. **7.95**

GEAR HEAD MOTORS

Heavy duty, G.E. motor. 2 HP, 24V, DC, 125 amp., reversible motor to drive a reduction gear unit giving 36 to 1 ratio at take-off. Unit will operate on 6 or 12 volts

36 to 1 G.E. (305 shaft RPM)
28 to 1 Eclipse (130 shaft RPM)
40 to 1 Eclipse (110 shaft RPM)

10.75 EACH

*GH6-528 Low GEAR HEAD MOTOR - Lear 24 volt DC, 7.6 amp, series wound reversible motor with overload clutch. Motor turns 11,C.. RPM driving thru a 10 to 1 gear reduction box which turns the final take-off shaft 1000 RPM. Adjustable limit switches control limit of travel. Take-off shaft adapts to flex or rigid drive. Size 10"x4". **9.95**

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If Your House Were A-Bombed

[Continued from page 99]

Cars somewhat closer suffered varying damage. Some were moved, others tipped over. Doors and trunk lids were sprung open—often in cars in which no glass was broken. Cars at very close points were, naturally enough, wrecked. These were all postwar cars, from '46s to at least one shiny new Cadillac, all donated by makers or dealers.

One important thing made clear is that an atomic attack is *not* an all-or-nothing proposition. It is not enough to say that if you're close you're done for and if you're far away you're safe.

The vital area is the one between. In this area you would probably be hurt or killed if you were unprotected. And you would probably come through, perhaps in fine shape, if you could get enough shielding between you and the blast without exposing yourself to falling timbers.

The evidence is that dummies in simple shelters "survived" when only two-thirds of a mile from Ground Zero; dummies in living rooms more than twice as far away suffered damage.

Basement Is Best

As a householder, your way of getting this protection of bulk is to put yourself and family into the basement. There you would have at least several layers of house between yourself and the triple hazard of initial radiation, searing blast and shock force.

And, more important, unless the explosion was almost directly overhead, you would have the enormous protection of many feet of earth—the ground outside the basement wall.

Your greatest hazard might be that your house would fall in on you. That's why the Federal Civil Defense Administration developed basement shelters of two types and planted them in the test houses.

One is a simple, rugged lean-to. Any man who can use a saw and hammer can duplicate it for less than $40. It is not big enough to stand in, so it isn't very comfortable. But it is highly efficient at its main job of withstanding even the heaviest debris of a falling house.

Much more comfortable, but about two or three times as costly to build, is the room-within-a-room. This one is big enough to hold four persons in comfort, permits them to sit in chairs. Basically it's a six- to seven-foot cube (depending on space and height available in your basement) that you build in a corner.

Each of these shelters remained unharmed, even through the total destruction of House 1. When observers were finally able to enter the area with reasonable safety they found that most of what was left of the house was being supported by the room-type shelter beneath it. Dummies in both shelters were not only unharmed but had remained in their original positions.

Concrete Pipe Makes Shelter

Also tested in the blast were assorted underground shelters. Every one came through the violence in perfect condition. One of these can be built independently of a house, permitting its use where there is no basement. It is a concrete pipe of large diameter buried in the ground and entered through a square hole.

Officials in charge of the test pronounced it a success. Detailed information will become available only after months of analysis but already it is clear that perhaps half the lives threatened in an atomic attack can be saved.

Knowing where it is safest to go and how shelters stand up may be worth millions of lives. The planners thought the houses would go pretty much as they did and that their shelters would survive.

But, as one man said in explaining the tests, "Thinking isn't knowing." END

What's Ailing?

Nurse Cutie: "Every time I take the patient's pulse it gets faster. What shall I do?"
Doctor: "Blindfold him."—*Wireco Life.*

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Rotary Lawn Mower **$42.50**; Sickle Bar-Mower **$42.50**; Lawn Mower Hitch **$4.50**; Cultivator **$8.75**; Rotary Tiller **$42.50**; Furrowing Tool **$8.75**; Disc Harrow **$15.75**; Plow **$8.75**; Snow Blow **$39.50**. Freight prepaid to most areas. Easy payment plan available.

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HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs., Item 10E, **$11.95**. 12" Fan, wt. 10 lbs. Item 10D **$12.95**

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Complete Motor and Chassis **$199.50**

Variable Speed Selector

(Item 68)

Heavy duty, made by **B. F. GOODRICH** for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists — any operation requiring variable speed. Ideal for midget autos. Employs reliable "trouble free" planetary system. No hydraulic power losses or creeping. Infinitely range, smooth operation, easy installation (data included). 3 sizes: ½-1 hp. wt. 26 lbs.; 1-2 hp. wt. 55 lbs.; 2-3 hp. wt. 105 lbs. Reg. list $228, $252 and $352. Our prices ... **$79.50, $89.50** and **$114.50.**

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(Handle included.) ½ ton (Item 208A) Wt. 15 lbs.... **$9.45**
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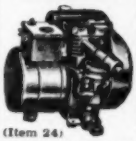

(Item 24)

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700-800 Watt Plant (Item 44) same as Item 24 but larger engine **$169.95**
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3000-3500 Watt Plant (Item 23) 115 v. 60 cyc. A.C. **Push Button Start.** Direct Drive. Wt. 270 lbs. Factory Price **$379.50**

(Item 31)

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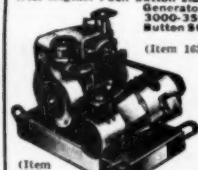

(Item 162)

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Generator and control box only, belt drive. Use your own engine or tractor. Wt. 240 lbs. (Item 163) Factory price..... **$345.00**
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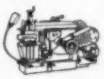

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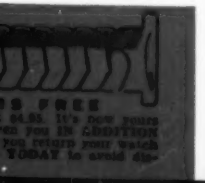

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